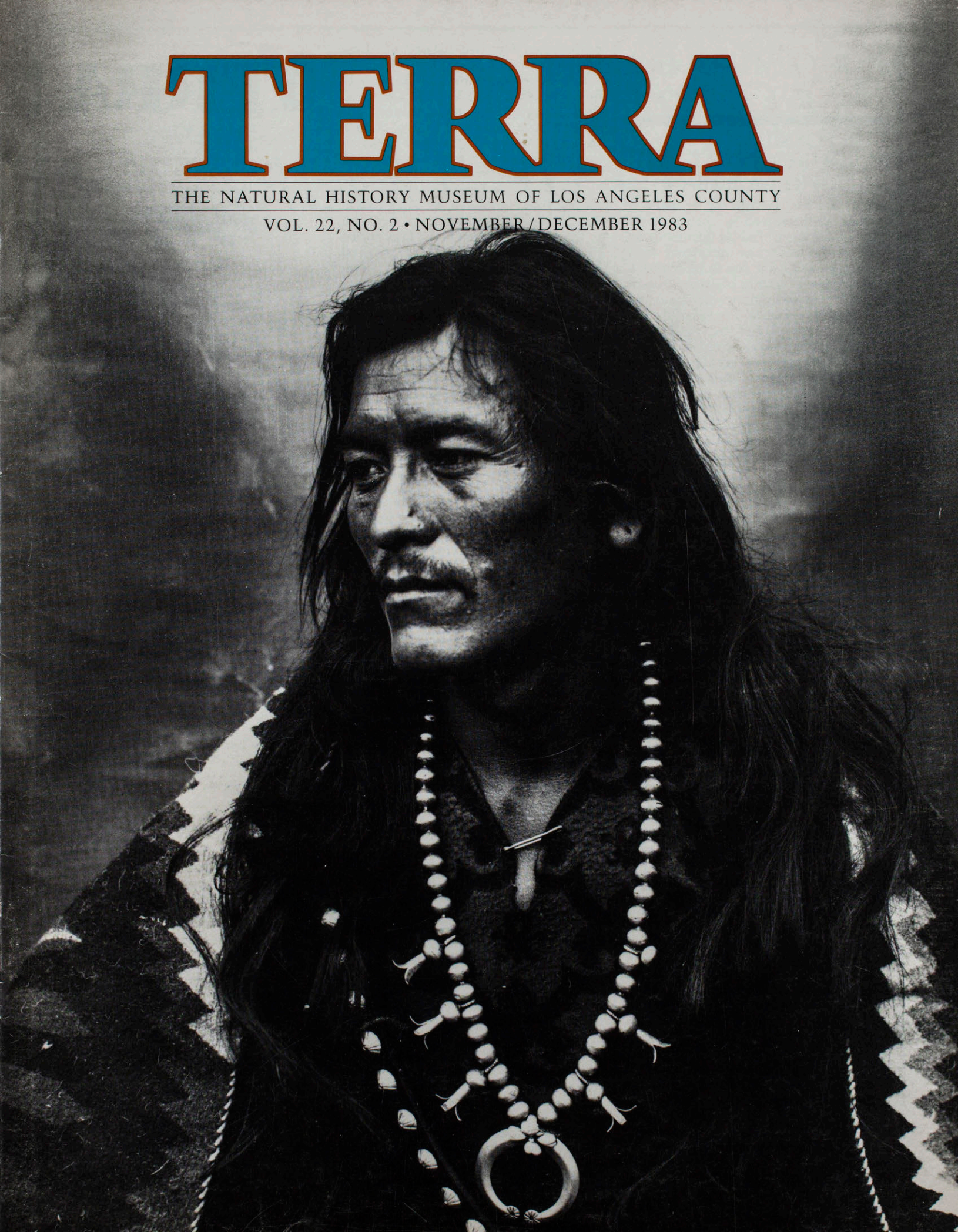
TERRA

THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

VOL. 22, NO. 2 • NOVEMBER/DECEMBER 1983



FROM THE DIRECTOR

THE FOSSIL RESOURCES OF RANCHO LA BREA

Fossils are not merely the remains of ancient life preserved by chance in the crust of the earth. Fossils document aspects of the history of our planet; they provide an essential key to understanding the present balance of nature. Fossils represent an extremely important but nonrenewable part of our scientific and cultural heritage. For this reason, the Natural History Museum of Los Angeles County views the conservation of fossil resources, whether in properly curated institutional collections or in their original undisturbed state in the ground, as one of its greatest responsibilities.

The central focus of any museum, the foundation upon which its reputation is based and the main area of activity of its staff, is the collections. Usually only a tiny fraction of the collections is placed on display to the public—in our museum the number of fossils placed on exhibit amounts to less than one percent of the total in our care. The remaining specimens are held in public trust for present and future study by the international scientific community.

The main differences between museum collections of fossils and those retained in personal collections are the number of examples of any one type of object and the degree of documentation provided for each. Both aspects are extremely important. One fossil provides an example of a formerly living species, but many specimens are needed to assess the extent of evolutionary change through time or the degree of variation displayed in different geographic or environmental settings. Moreover, it is not possible to make such deductions unless we know precisely where the specimens came from, their geologic age and the conditions under which they were preserved as fossils. Thus, if we are to seriously explore the past history of life on our planet, it is important that our interpretations should be based on as large and as well documented a sample as possible.

The Natural History Museum administers the largest scientific collection from Rancho La Brea and is charged with the care of Hancock Park, the area from which most of the Rancho La Brea fossils have been recovered. Additional fossil deposits are known to occur in the surrounding area. With the increasing pressure for construction and development in this region, such irreplaceable scientific resources are threatened with possible loss or total destruction during the next decade. The Museum is deeply concerned for the future of these resources.

Extensive collections of Rancho La Brea fossils are stored at the George C. Page Museum and are displayed and studied both there and at the Natural History Museum. These fossil materials are internationally famous, and their scientific importance is acknowledged by the formal designation of Late Pleistocene time in North America as the Rancholabrean Land Mammal Age. Due to the size of our Rancho La Brea collections, we are often asked "Aren't these large collections sufficient?" and "How many more fossils are needed to provide a proper and adequate sample for posterity?" The simple answer to both questions is "We do not know."

The largest portion of the Museum's collection of Rancho La Brea fossils was recovered between 1913 and 1915. Some 750,000 specimens were retrieved using techniques that were among the most advanced and thorough of that time. However, because of scientific progress during the ensuing 70 years, the information that these fossils provide today is far less than would be the case had these fossils been left in the ground for another half century. As in all active fields of scientific investigation, paleontologists are constantly identifying new areas of inquiry that will help us understand more about life in the past. Collection techniques will continue to be refined, and it will never be possible to anticipate all the needs of future generations of researchers.

As an example, a recent issue of *Science* (June 17, 1983) contains an article by Dr. T. H. Loy explaining that it is now possible to identify animal blood on ancient stone tools—and even the species of animal to which the blood belonged. Dr. Loy's announcement is particularly relevant to the study of the California sabertooth cat (California's state fossil), one of the more common fossils from Rancho La Brea. These giant sabertoothed cats have long held a fascination for the scientist and the layman alike. Perhaps the study of blood preserved on the huge canines of the sabertooth cat can be used to supply answers to questions such as "What animals did they feed on?" and "Why did they become extinct?" Unfortunately, previous and present techniques used to clean and prepare Rancho La Brea fossils effectively remove such blood residues, and only new collections made from undisturbed fossil deposits can be used for this type of study.

The importance of the fossil deposits in and around Hancock Park cannot be overestimated. They hold the key to resolution of many current and future questions about the surroundings in which the first human immigrants to North America found themselves. These un-

(Continued on page 31)

TERRA

THE MEMBERS' MAGAZINE
OF THE NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY
AND THE PAGE MUSEUM
OF LA BREA DISCOVERIES

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Photograph from a glass negative in the Vroman collection in the Seaver Center for Western History Research, Natural History Museum of Los Angeles County. Notes in the center's files indicate that the subject is the Navajo man Ah del Staline ("Straight Shooter") and that the photo was taken in 1903.

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NAVAJO SILVER AND THE EYE OF THE BEHOLDER

by LOUISE LINCOLN

Despite its associations jewelry is never, in a broad sense, frivolous or trivial. In every human society jewelry, like clothing and body decoration, proves on examination to say a great deal about the wearer's age, identity, self-image, and social and economic position. It reveals even more about the values and the structure of the culture itself. The fundamental purpose of jewelry seems obvious: it is intended to enhance the appearance of the wearer—to be "beautiful." But what we mean by that term varies widely from society to society.

In a sense Navajo silver jewelry transcends this linguistic and aesthetic question of what "beautiful" means. The Navajo undoubtedly think it beautiful, or they would not make and wear it. In the mainstream culture too these objects have long been admired and worn. Beneath this agreement, however, lie very different ideas about what beauty is and means. And while an outside observer may be satisfied to appreciate the beauty of Navajo jewelry in terms of his or her own culture, it is far more rewarding to attempt to understand it on its own terms. The Navajo aesthetic system is complex, subtle, and not easily approached. But by beginning with the objects themselves, isolating what is peculiarly and particularly Navajo about them, and drawing in pertinent information about other aspects of Navajo life and culture, we can gain insights into the more intangible aspects of their beauty. What does Navajo silver look like? Why does it look the way it does? Why have Navajo artists made certain visual choices; what ideas or values have informed their decisions? Where did this recognizably Navajo style come from and why has it developed as it has?

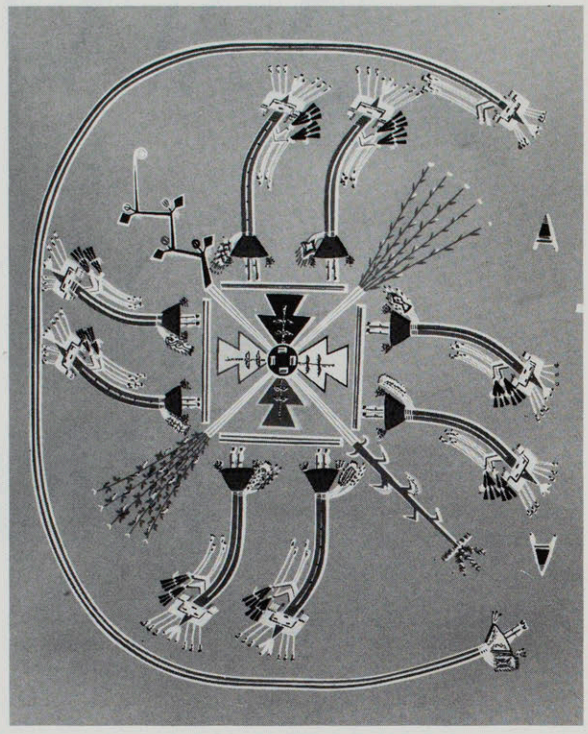
Perhaps the most immediately striking characteristic of traditional Navajo jewelry, and that of Southwest Indian jewelry in general, is its consistency of materials. We have come to associate automatically the combination of turquoise and silver with the American Southwest. Similarly, the forms produced—the cast bracelet, the squash blossom necklace, the concha belt—are distinctive, consistent, and immediately recognizable. Most important for our purposes, however, are certain stylistic characteristics that are nearly universal in application. Traditional Navajo jewelry, as a rule, is strongly symmetrical along one or two axes; there is a strong focus on the center of the design field; curved and straight elements are frequently juxtaposed; stones tend to be larger relative to those in jewelry from other Southwest groups; and the silver surface is enlivened in various ways, most frequently through the use of small repetitive stamped elements.

That these stylistic devices are not simply typical of jewelry in general may be demonstrated by looking quickly at examples of Navajo weaving, the other greatly sophisticated art form among these people. Here too symmetry, division of the field by two axes, a strong center device, and small repeated design elements are to be found. The same principles of design appear in sand paintings, elaborate depictions in colored sand of mythic scenes and personages. Sand paintings are used in healing practices, and are an extremely interesting and specialized form of art. The Navajo perceive what we term "illness" as dis-order. When someone has become sick—unbalanced in a physical or psychic way, he or she can be restored to health through chants, through administration of various plant-derived drugs, and, especially, through exposure to a sand painting. These standardized, symmetrical, geometric depictions of universal order serve to recall episodes of Navajo mythic history and to attract benevolent forces to the patient. Most importantly, however, they restore balance, health, and happiness through their depictions of an ideal state. Silver, textiles, and sand paintings, then, all demonstrate these characteristics of symmetry, focus, and



Left: Navajo weaving designs, like those in silver, are frequently focused strongly on the center and divided into symmetrical quadrants. This blanket, from the 1930s, is in the collections of The Minneapolis Institute of Arts.

Below: Sandpainting from the Beautyway ceremony. Sandpaintings, which are used to restore the sick to health, reflect the idealized structures and order of the mythic past. (From Beautyway: A Navajo Ceremonial, *edited by Leland C. Wyman, Bollingen Series 53, plate 11. Copyright © 1957 by Princeton University Press. Reprinted by permission.)*



secondary decorative elements. To discover the origin of these stylistic traits, we must look first at the history of the Navajo people.

In part, the Navajo style in silver results from historical chance and historical events, and its development is interwoven with the complex history of the Navajo themselves. The Navajo are a wandering branch of the Athapaskan people, whose original homeland lies in central Canada. Some time after the tenth century A.D. the ancestors of the present-day Navajo, together with those of the Apache, began to move slowly southward across the Great Plains, adapting their means of livelihood to the changing climactic conditions. We have no means of knowing what sort of jewelry these "proto-Navajo" wore, but it is certain that they wore some. When they reached the Southwest, they encountered the Pueblo cultures and adopted extensively but selectively various Pueblo culture traits.

It was at this time that the Navajo learned to make pottery and basketry and to weave. Archaeological finds indicate that the Puebloans wore jewelry of shell, stone, and other natural materials, much of it obtained through extensive and complex trade networks with distant groups. Not long after the arrival of the Navajo, the Spanish began to push northward from Mexico in the sixteenth century, expanding their colonial territories. They attempted to exert control of the area through military campaigns, religious proselytizing, and through gifts and trade goods. Prime among the latter was jewelry, and like other European conquerors the Spanish frequently included silver objects in their peace offerings. In the eighteenth century Hispano-Mexican silversmiths found it profitable to travel through the more northern regions occasionally, making silver objects for various Indian groups. By this time the Navajo were clearly wearing silver jewelry, but we do not know precisely when they began to make it for themselves.

The United States declared New Mexico its territory in 1846, and white settlers from the east took more and more land, in spite of raids of resistance by the inhabitants. In 1863 the U.S. government undertook a military campaign against the Indians in the area, especially the roving Navajo and Apache. Those who surrendered were interned for four years at a distant military camp known as Bosque Redondo, where they were ravaged by famine and disease. In 1868 a treaty permitted the surviving Navajo to return to their homeland, and to a drastically altered way of life. What evidence we have suggests that a few Navajo smiths were beginning to work silver in the years just before the Bosque Redondo internment, and when they returned the practice spread quickly through the reservation.

Many factors contributed to the sudden popularity of silverwork. First, although metalworking was doubtless known before the Bosque Redondo internment, the Navajo, especially the Navajo men, had been existing under the extremely difficult conditions of guerrilla warfare. Now, living in peace, they could turn their attention to smithing. Secondly, their economic base had changed drastically. The United States government now provided, if quite inadequately, for some of their needs, but the Navajo lacked materials for barter. Silver quickly came to play a major role in the system of trade. Lastly, the time of Bosque Redondo was one of tremendous cultural stress. It has been suggested that such periods often bring forth new or altered forms of cultural expression. One has only to think of the Plains Indians who abruptly produced a fluorescent style of beadwork at about the same time or of the period of artistic ferment in Europe growing out of the social and political changes surrounding World War I for parallel examples.

The early jewelry the Navajo made depended heavily on Spanish prototypes: the squash blossom bead so familiar from Navajo necklaces is borrowed directly from a Spanish silver button commonly used on the sides of men's trousers, and from a preexisting Spanish decorative motif. Crescent-shaped necklace pen-



The Navajo silversmith Peshlakai Ilhine, photographed about 1885. In this carefully arranged studio photograph, all the usual forms of Navajo silverwork are displayed, from the buttons on his boots to the elaborate bridle hung by the gun at his side. Photograph courtesy of the Smithsonian Institution.

dants, or najas, were adapted from a type of horse bridle ornament that the Spanish in turn borrowed from the Moors. It is interesting to note that despite the isolated residence patterns and difficulty of communication of the reservation in the late nineteenth century, both techniques and styles of jewelry-making spread in a surprisingly short time. This suggests not only that smiths were willing to share knowledge and techniques, but also that there was a great deal of interest in the appearance of jewelry and some agreement about how it should look.

By the end of the century the Santa Fe railroad had reached the Southwest, and a thriving tourist trade developed. Indian goods came to be in demand as souvenirs, and white entrepreneurs encouraged artists to make textiles, pottery, baskets, and silver specifically for this market. While tourism came to be an important economic factor in reservation life, it also dictated significant changes in style and workmanship in all the crafts. Silver became lighter, cheaper, more elaborate, and more artificially "Indian" in style. It is at this point that arrows, tipis, swastikas, and other motifs begin to apear in silver and textiles.

The effect of the commercial market continues to the present, but other influences are perhaps stronger. Contemporary Navajo smiths, trained in art schools rather than through the apprentice system, are more aware of trends in European and American design and incorporate some of these ideas in their work. At the same time they have not forgotten the heritage of traditional forms, and they combine the old and the new in highly creative ways.

The materials, then, of Navajo silver, and certain aspects of its design are derived from historic factors. Various models of stone jewelry had been common in the Southwest for centuries; the Navajo learned silverworking techniques—in all probability as an offshoot of blacksmithing—and the material, silver, was readily available in the form of coinage. In the early days smiths experimented with settings of various stones, including garnets, and even chips of colored glass, but the overwhelming preference was, and is, for turquoise, a stone that had been used as a jewelry material in the Southwest for centuries.

If the materials and the basic types were the result of Navajo exposure to outside influence through historic chance, the style—the details in design and execution that differentiate Navajo silver from similar objects—evolved rapidly by selection from a large vocabulary of design motifs borrowed from outside sources. The smiths did not select these ideas or motifs in a random, grab-bag fashion. The objects they produced display a coherent, well-defined aesthetic; they are not contrived, and the disparate elements seem natural, not forced, in their relationship to each other.

This coherence results from the manner in which the smiths, singly and collectively, made the necessary visual choices. Their decisions were governed by certain assumptions about how things should look that were, as we suggested earlier, commonly held. At a deeper level, these visual standards were, and, it can be argued, always are formed by the fundamental beliefs and values of the culture. By these fundamental values I mean to describe the principles and ideals by which people conduct their lives, organize their social and economic behavior, raise their children, and so forth. Because of the specific set of ideals held by the Navajo smiths, certain design principles and motifs were adopted, others rejected. The result is a distinctive style that is both governed by and consciously expressive of these moral and philosophic principles.

We have already discussed briefly the visual characteristics of Navajo silver. But how do these relate to societal ideals? For example, what moral notion is encoded in the visual principle of symmetry that we have noticed so frequently? Fortunately the Navajo have made this easy for us by the use of a revealing descriptive term. In the Navajo language a silver object that was considered satisfactory or "good" would be de-

scribed as evincing the quality of *hozho*. The term is roughly and inadequately translated as "beauty," but its broad meaning has no precise English equivalent. It implies as well order, stability, harmony, health and wholeness. As the anthropologist Gary Witherspoon has noted, "*Hozho* expresses the intellectual concept of order, the emotional state of happiness, the moral notion of good, the biological condition of health and well-being, and the aesthetic dimensions of balance, harmony, and beauty." A well-tended cornfield exhibits *hozho*, a clean and orderly house exhibits *hozho*, a pleasing landscape, a fast horse, a shared meal all partake of *hozho*. The Navajo hold a small ceremony on the occasion of an infant's first laugh, to ensure that the baby will continue to be happy, healthy, and generous. *Hozho* does not necessarily relate to external appearance; a hogan, or traditional Navajo dwelling, may appear to an outside eye as a rough hut of mud and logs, but it is kept in a state of order and cleanliness. Similarly, an elderly Navajo man remarked to a white anthropologist, "You look at me and see only an ugly old man, but within I am filled with beauty."

A Navajo would describe the concept of *hozho* as the central principle of what we call religion, philosophy, and aesthetics. And it is through this complex and carefully articulated principle that every aspect of Navajo life, from the mundane to the sublime, is lent focus, purpose, and form.

The importance placed on the social value of balance and harmony—avoidance of excess of any kind, peaceful social relations, and so forth—is reflected in the aesthetic principle of symmetry. The design field for bracelets and *ketohs*, leather bands worn to protect archers' wrists, is nearly always symmetrical in two or four directions. The traditional squash blossom necklace seems at first less "symbolic" in this regard, but it carries the same message in slightly different form. Rotating on one axis, it is centered on the traditional crescent-shaped pendant, or naja. This pendant is not just a visual center, however, but a center of weight as well. Without the naja, a necklace would lack a way of maintaining its alignment, of defining its axis. The naja keeps the necklace in balance. A necklace that hangs well and is well made and well ordered reflects and conveys *hozho*; it is, in our perhaps overly simple term, beautiful.

Other stylistic characteristics also translate into philosophic principles related to *hozho*. The combination or balance of curved and straight elements, for example, which is perhaps most noticeable in cast pieces, is heavily freighted with meaning. The contrasting linear elements "balance" each other and imply completeness, the presence of all components. The curve of a curved line is in effect meaningless without reference to a straight line. The Navajo see a similar "balance" between activity, which is explicitly associated with the curve, and stasis, which is associated with straight lines. In turn, activity is considered a trait of the female, both human and divine, while stasis is connected to gods and men. Thus curved and straight lines



Jewelry produced for the tourist trade after the 1920s was stamped out of thin sheet silver, often by machine. The nontraditional pin form and the use of the arrow motif mark these two examples as souvenir goods.

FINISHED IN BEAUTY

Southwest Indian Silver from the Doneghy Collection

Beginning December 7th, more than 300 masterworks of Navajo, Hopi, Zuni, and Pueblo Indian silversmiths will be on exhibit in the Ground Floor Changing Gallery of the Natural History Museum. The exhibit covers a wide range of decorative silver pieces, including bridles, concha belts, ketohs and dress ornaments as well as classic necklaces, bracelets and rings, many decorated with turquoise and coral.

The exhibit examines the silverwork of the American Southwest in the context of the cultures that produced it. The pieces date from the mid-1800's, when the Navajo first adapted the silversmithing techniques and designs of the Spanish, through the period of commercialization of the native silverwork (about 1910 to 1940), to the present, in which a return to traditional designs has been invigorated by new expressions of individuality.

The exhibit continues through February 26th. It was organized by The Minneapolis Institute of Arts and made possible through a generous grant from the National Endowment for the Humanities.

The opening of the exhibit coincides with the 12th Annual American Indian Festival at the Museum from December 7th through 11th. A special preview of the exhibit and festival will be held for Museum Members on Tuesday, December 6th, from 6:30 to 9:30 p.m. The evening's events include demonstrations by craftsmen and performances by the Inter-Tribal Dancers of Los Angeles; Members will also have a chance to select from an extensive array of weavings, baskets, pottery, jewelry and other artifacts offered by demonstrating craftsmen through the Ethnic Arts Shop.

For further information and reservations, call the Membership Office at 213/744-3426.





Above: The ketoh, a band of leather worn to protect an archer's wrist from the snap of the bowstring, was embellished with silver from the late nineteenth century onward. This 1930s plaque, with its stylized corn-plant motifs, shows clearly the combination of curved and straight elements typical of Navajo design.

Left: The squash blossom necklace synthesized various borrowed forms from Hispano-Mexican silver into an extraordinarily coherent whole. Combining the naja or pendant used to decorate elaborate horse bridles with conventional spherical beads and caballeros' pomegranate-shaped trouser buttons, early smiths evolved a form in which the symmetry, balance, and progressive rhythm are in complete harmony with other Navajo aesthetic expressions.

taken together represent wholeness, just as in ideal social relations the male and female complement one another. Each is a necessary part of the whole.

Perhaps the most complex knot of meaning lies in the arrangement of design elements into quadrants—the orientation of the work along two perpendicular axes. Quadrantal symmetry is simply another way of describing orientation to the four directions, and the Navajo's interest in the cardinal directions is revealed in numerous aspects of daily and ceremonial life: architecture, farming, sand painting, dance, and the like. In the mythic origin of the Navajo people, furthermore, their ancestors emerged from an underground world at a place known as Emergence Rim. This hole marked the center of an area of land surrounded by four mountains, one at each cardinal point. This organization of geographic space into quadrants, each associated with a mountain on the periphery of the territory, brought order out of chaos at the creation. The number four is considered of special significance, and its importance is explicitly derived from the four mountains of the creation story. Representations of Emergence Rim and its surrounding mountains are common in sand paintings, where they are depicted as spots or circles arranged in a quincunx—that is, four equidistant points surrounding a point at the center. This motif, a kind of shorthand summary of the history of the Navajo people, is carried over into silverwork as well. Wearing a ketoh that shows in abstract form Emergence Rim and the four sacred mountains, one is linked inexorably to the earliest ancestors and to the ideal past.

It may be argued that the Navajo design characteristics we have discussed most extensively—symmetry, balance, focus at the center—are normative: that is, given one stone to "arrange" anyone would place it at the center of an object. Similarly, the system of values briefly described above may seem unremarkable: harmony and balance are not highly unusual as social principles. But just as a curved line in silver assumes meaning in contrast to a straight line, so *hozho* and its visual expression form a coherent whole when set against a contrasting aesthetic system. The art and thought of the Zuni provide a startling example.

The Zuni people are as well known as the Navajo for their skill in silversmithing, but they are vastly different from their neighbors both in culture and in artistic style. They belong to a different language group, and their social, religious and kinship systems, and the values derived from these, are quite different also. The Zuni learned to work silver from the Navajo about 1872, and we know from period photographs that their early pieces resembled those of the Navajo. But using the same elements of

turquoise and silver, they quickly developed a style based on a different aesthetic and an entirely different way of looking at their materials. Differentiating Navajo and Zuni silver is often confusing to the novice; the materials are the same, the forms are similar. Indeed the line can blur for experts, and even for some smiths, who occasionally work in their neighbors' style. There is nonetheless a well-established "traditional" Zuni style, separable from that of the Navajo.

The silver so lovingly worked by the Navajo serves the Zuni chiefly as a medium to set turquoise, and the stones are often cut in small pieces of roughly equal size and arranged in radiating or grid designs. Zuni rowwork bracelets display closely set small turquoises—dozens of tiny identical units—in contrast to the Navajo preference for a single large stone. Similarly, Zuni smiths cover the entire surface of the squash blossom bead with turquoises, and the round beads become an invisible supporting structure for the necklace, which seems to consist of closely set, unvaried squash blossom units. The effect is far different from the alternation of round and squash blossom beads present in the classic Navajo arrangement.

Not surprisingly, there is a corresponding dissimilarity to be found in Zuni aesthetic preferences. Whereas Navajo cultural expressions, as we have seen, emphasize harmony, simplicity, and focus, the Zuni stress complexity, multiplicity, fragmentation and elaboration. Visual elements are often composed to suggest dynamic motion. The Zuni term *co'ya*, like the Navajo *hozho*, means "beauty," but the aesthetic it describes encompasses multiplicity, asymmetry and surprise. Like Navajo silver, Zuni jewelry exhibits a specific kind of beauty that links both the maker and the wearer to their society.





Two bracelets from the 1930s provide a graphic demonstration of the differentiation between Navajo and Zuni styles. The Navajo piece (above) makes sculptural use of both silver and stones, its design focusing strongly on the center. In contrast, the Zuni bracelet (left), dissolves the surface into a flat, whirling mosaic of turquoise bits.

Among the Navajo everyone who can afford jewelry wears it. Even in times of hardship most Navajo own at least some jewelry. It is not reserved for special occasions, and although most people wear more jewelry, or their best jewelry, at the time of ceremonials or dances, a considerable amount of jewelry is worn in everyday pursuits. Such constant display of ornament might suggest that jewelry functions as a means of ostentation; although jewelry was and is associated to wealth and social status among the Navajo, as elsewhere, the patterns of jewelry wearing among the group are not that simple. We may further note that the Navajo continue to make and wear distinctive silver jewelry even though other traditional elements of dress and hairstyle have almost entirely disappeared. Silver jewelry continues to play an important role in Navajo ceremonial life. At a girl's initiation ceremony, for example, the initiate wears much jewelry, the chanter or singer is regularly paid in jewelry, and the participants in the ceremony often receive gifts of jewelry from the girl's family. This persistence of jewelry in everyday and ceremonial life suggests that it contributes to group identity, that it functions to set the wearer apart from those outside the group. It expresses a certain resistance to external influences. In other words, in the minds of its wearers there is something essentially Navajo about Navajo jewelry.

In the traditional view, however, the primary reasons for wearing jewelry are internal, not external. Decorating the body with beautiful objects helps to make one beautiful on the inside: that is, the jewelry promotes an attitude or state of mind that is, in a broad sense, beautiful. It reflects, even produces, an inner condition of *hozho*. *Hozho*, as it is applied to spiritual and physical condition, denotes numerous ideals. One should be active yet serene. One should seek diversity but also balance. Social relationships should be harmonious. Neatness and order are necessary in all things. Extremes are to be avoided. One should be aware of one's place in the cosmic order. Wearing jewelry (and for that matter clothing) that encodes these values enhances these ideal qualities in a person. Because jewelry has this prescriptive, almost homeopathic effect, its beauty cannot take just any form. It must be beautiful within rather narrowly defined limits; it must convey in abstract form the ideal of *hozho*.

Among the Navajo, then, jewelry can be seen to function as an indicator of economic and social status. It is also a badge of identity—worn to differentiate the wearer from those outside. But beyond these communicative roles, in which it speaks to others about the status and identity of the wearer, jewelry has an internal, active role. Both the

jewelry and the person it adorns are in harmony with social ideals. Remembering the use of sand paintings in healing, and the Navajo definition of sickness as dis-order, we can also say that jewelry keeps one in a state of balance and harmony; it is a symbol of well-being.

It is impossible to overstate the degree to which Navajo artists consciously strove to express these complex ideas in visual form. Sand painting provides the clearest example, but the content is not less deliberate in silver, or for that matter in weaving. Navajo iconography is as carefully constructed, as subtle, and as complex as that of any religious painter of twelfth-century Italy—perhaps rather more so, since the Navajo artists sought to convey abstract ideas through abstract symbols. Within traditional Navajo culture, and to a large degree among more acculturated Navajo as well, these ideas and symbols are commonly understood and are widely discussed and argued. The artist's intent is readily conveyed to the viewer or the wearer through the object itself.

Thus, in Navajo ideology, heavy demands are placed on the artist. To put the issue once again in deceptively simple terms, beauty can only be produced by those in a state of beauty. The conveyance of the philosophic principle of *hozho* requires first that the maker be knowledgeable about *hozho* and second that she or he be in a state of *hozho* during the creative process. The principle applies equally in other areas of endeavor: the successful farmer is one who plants crops in a state of *hozho*; the ritual healer can only effect a cure—that is, can only return the patient to a state of *hozho*—by being in a state of *hozho*; a hogan reflects *hozho* only if its builders have achieved that condition. Chants and prayers typically end with an invocation of *hozho*. With regard to silver jewelry, the object links together the artist, the wearer and the viewers; it is the means whereby *hozho* is transmitted from the maker to the recipient or audience, who will in some measure be brought into a state of beauty through viewing, wearing or appreciating what the artist has made and done.



Zuni smiths expand the surface of the traditional squash blossom bead by attaching a small silver plate on which stones are mounted. Although the "blossom" still peeks out of the turquoise clusters in this example, it has become thoroughly subordinate to the surface design.

Thus far we have been focusing on traditional Navajo society, traditional values, traditional silver. We have laid out an aesthetic system—and really much more than that, a way of life—that is conscious, elaborate and consistent. Naturally not every item of silver jewelry can be viewed in this light. Jewelry produced for the tourist market is only the largest group to form an exception. But what are we to make of modern jewelry that is not mass produced, that is individually designed and fabricated in more or less the traditional manner but does not conform to the characteristics of style we have observed in the traditional pieces? Jewelry of the so-called New Indian Style is frequently asymmetrical and focused away from the geometric center; it makes broad use of straight lines and sparing use of curves and combines a dazzling profusion of multicolored settings in addition to turquoise. Although it appears that the expression of *hozho*—of a specific kind of beauty—has been lost, this is not entirely true.

It is probably safe to say that most contemporary Navajo smiths are aware of the principles of *hozho*. But they are subject to other influences as well. Societal values are not eternal and immutable, and the traditional ideals of the Navajo are inevitably altered by the values and ideals of the outside culture. Smiths may incorporate some manifestations of the old virtues of *hozho* in their work, but they may also wish to signal other interests, other influences. Many have been trained in art schools in the mainsream culture; many choose to borrow design motifs from other American Indian groups to express political solidarity; many have adopted the external artistic value of newness and idiosyncratic personal expression. Clearly, a shift in values has produced corresponding changes in jewelry styles. The new style speaks clearly of a less coherent world view, of divergent aspirations and intentions. Yet just as in older pieces, the design principles on which the object is based are a conscious strategy to convey certain ideas and produce certain effects.

We have looked at Navajo silver not to admire it superficially but to learn from it as much as possible about the culture that produced it and its meaning in that culture. What appear to be relatively simple reasons for its existence, manufacture and display—that it is beautiful, that it beautifies the wearer, and that it

reflects the beauty of the maker—prove to be quite complex, for the fundamental ideals and assumptions of the culture are subtle, deep and interlocking.

Having read from or through specific objects of art to the cultural ideals that inform and inspire them, and having reached some appreciation of these ideals and values, we can reverse the process to good effect and reexamine the objects in a new light. Given a culture that is relatively homogeneous, well integrated, cohesive, and traditional, such a method works admirably well. In truth, within a highly integrated society there is no need to start with an art object, for no matter what aspect of the culture one examines, serious and sympathetic consideration will lead back to the same central values.

Yet there is something peculiar about what we call art—something we tend to lose sight of, living in a complex, pluralistic society where, as often as not, the artist plays the role of satirist or social critic. In a traditional, cohesive society, the artist is the most articulate spokesperson for the values of the culture. Art is invariably rooted in and descriptive of those ideals that are most deeply held. Among the Navajo, jewelry traditionally serves to enhance the behavioral and cognitive aspects of these ideal qualities, and it is a highly conscious articulation of these values. And although the aesthetics of modern Navajo jewelry are considerably different, they are no less true to the society.

This is why the Navajo take jewelry so seriously. It is able to articulate ideals of thought and behavior and to give those ideals both abstract form and concrete reality. And this is why Navajo silver is not merely frivolous ornament, but a form of art that is both elegant and symbolic—a miniaturization of the Navajo universe, an abstract depiction of Navajo thought.

Louise Lincoln is Assistant Curator for African, Oceanic and New World cultures at The Minneapolis Institute of Arts. She recently organized the exhibit Finished in Beauty: Southwest Indian Silver from the Doneghy Collection, which will be on display at the Natural History Museum from December 7, 1983, through February 26, 1984. Ms. Lincoln also edited the exhibit's comprehensive catalog, Southwest Indian Silverwork from the Doneghy Collection *(University of Texas Press, 1982), and wrote one of the catalog essays.*



Jewelry was not reserved for special occasions. Here, a woman holding a baby and two lambs wears a traditional velvet blouse heavily studded with silver buttons. The baby wears a turquoise necklace and small turquoise tab earrings. Photograph by Laura Gilpin, courtesy Amon Carter Museum, Fort Worth, Texas.

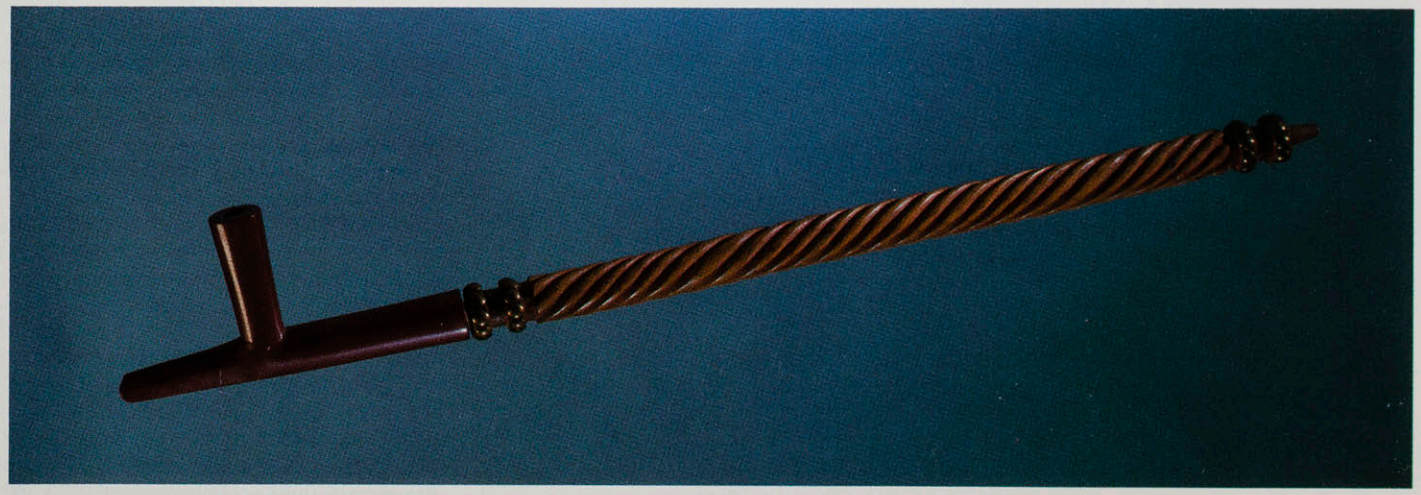
The Sacred Pipe as Artifact and Prayer

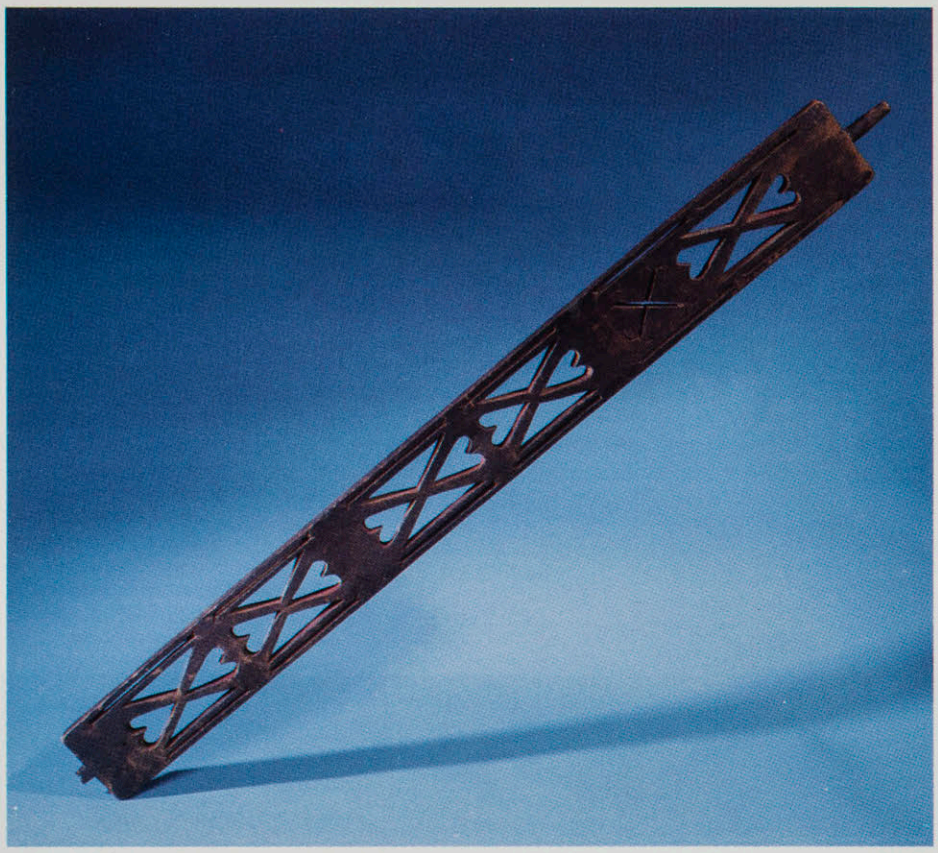
by PETER T. FURST
and
JILL LESLIE FURST

Spiraling in nature, as in vines or snail shells, was a potent symbol of new life and growth to eastern Plains and Great Lakes Indians. Below, center: In this eastern Sioux pipe, dating from the mid-nineteenth century, the long hardwood stem is carved into a double spiral ending on opposite sides near the mouthpiece in two streamlined heads of a long-beaked water bird, presumably representing the owner's guardian spirit. The catlinite pipe bowl is beautifully embellished with lead inlay. Length: 30¼ inches. Private collection.



Bottom: A tighter spiral is carved on this nineteenth century Plains Indian pipe. Length: 43 inches. Natural History Museum of Los Angeles County.





Above: This complex openwork "puzzle pipe" (so called because only the carver knew the exact route by which the smoke traveled from bowl to mouthpiece past the cutouts) was collected by English missionaries among Great Lakes Algonkian-speaking peoples in the late eighteenth century. Length: 35⅛ inches. Private collection.



Catlinite pipe representing a fanged and crested water spirit, with a catlinite stem in the form of a fish. This was carved in Minnesotà in the early second half of the nineteenth century. Several very similar eastern Sioux pipe bowls have survived in private or museum collections, but complete pipes of catlinite are rare. Length: 8⅝ inches. Private collection.

Thousands of Plains Indian objects that are now treated—and traded—as "art" were once integral to the First Americans' everyday existence, which was indivisible from religious emotion. Of these objects, perhaps none embodies more fully some of the Indians' basic values, ideology and world view than does the smoking pipe. Aesthetics, the interdependence of the sexes and of the people and the natural and supernatural environment, the relationship of human beings to Mother Earth and Father Sky—all these and much more were contained and expressed in ritual smoking and in the material objects used to share the sacred smoke among the people and with the superior spirits of the universe.

And these are not things of a dead and forgotten past. The sacred pipe continues to live, as do the Indian people themselves. Even today, a century after the tragedy at Wounded Knee, the pipe and the sharing of its fragrant smoke with the spirits continue to be powerful symbols of national and ethnic consciousness for many descendents of the ill-fated Ghost Dance movement. The Sioux holy man and seer, the late John (Fire) Lame Deer, expressed his belief in the smoking rituals in his autobiography: "As long as we had the pipe, there would be a Sioux nation."

The pipes shown on these pages afford some idea of the great care, technical expertise and ingenuity, and highly developed aesthetic sensibility that the pipemakers of the Indians of the Plains, Prairies and Woodlands lavished on their sacred smoking paraphernalia.

In Siouan tradition, which was shared by some of their neighbors, the gift of the first pipe came from a female spirit, the marvelous White Buffalo Calf Woman. One version of the story tells of a terrible winter long ago, when the ancestral Sioux still lived near the Great Lakes. This winter was so much worse than any they had ever known that it forced them to move and seek food in a more benign environment to the south and west. This was long before the horse appeared on the Plains, and all the Indians' meager belongings had to be carried by hand or pulled along by the people and what few dogs had survived starvation. Game was scarce or nonexistent, and as they struggled through the deep snow, many of the tribe were near exhaustion and death.

Two young men were scouting ahead—when they finally found a deer they killed it and left it for their relatives to find while they pushed on through the swirling snow. Suddenly out of the mist there appeared to them a beautiful maiden, clad in the finest white buckskin. One of the men at once recognized her as a supe-

rior spirit, but the other saw her only as a woman, there for him to take. When she warned him to come no closer and he ignored her command, fog suddenly descended and there was a terrible rattling sound; the mist then cleared, and the first man saw that the offender had been transformed into a pile of bones.

The young woman revealed herself to the respectful survivor as the holy White Buffalo Calf Woman. She instructed him to prepare a sacred lodge, where she would meet on the following dawn with the bravest and wisest of the band.

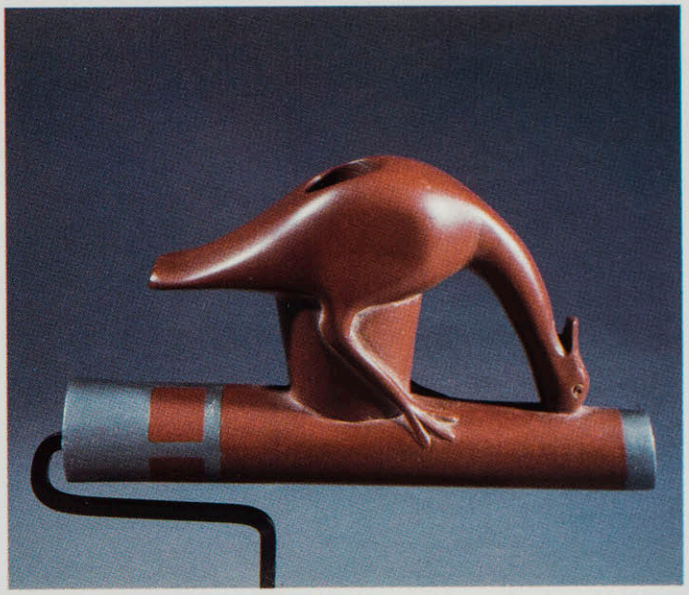
When the holy woman appeared at the lodge, she gave the band's leaders a wonderful pipe, made from the leg bone of a buffalo calf and beautifully decorated with feathers and other adornments. The young man who had first seen her became its hereditary keeper. She taught the people to pray with the pipe and gave them their most important ceremonies. She also gave them seeds of corn, beans and squash and the knowledge of planting, and she foretold the coming of the horse. Ever since, according to Sioux tradition, nothing of importance is conducted without a pipe.

Before departing the holy woman instructed the young pipekeeper to take hunters and kill and preserve the skin of a beautiful white female animal that they would find in the midst of a herd of buffalo. The spirit woman then walked out of the ceremonial lodge and melted into a herd of buffalo in the distance, where the people saw her first transformed into a black buffalo, then a red one, and finally into a white buffalo cow.

The young hunter did as he had been told and brought the skin back to the people. The Buffalo Calf Pipe became sacred to the whole community, to be unwrapped and smoked only on holy occasions. According to Lame Deer, this ancient pipe, now brittle with age, survives to this day in the care of a family that has preserved it as hereditary pipekeepers for fourteen generations. The same family also keeps a second and very sacred tribal pipe, which is one of the first made by the Sioux from the red pipestone known as catlinite, in accordance with the instructions of White Buffalo Woman.

Catlinite is found in southwestern Minnesota, at a sacred Indian quarry now known as Pipestone National Monument, which has been the principal source of Plains pipe material for several centuries. In fact, the distinctive blood-colored stone has been quarried there since about A.D. 1600, originally not by the Sioux but presumably by Oto and Iowa Indians who then inhabited that region and who were displaced by the Sioux around A.D. 1700. In the earliest times, the quarry had been consid-

Catlinite pipe bowls with decorative or symbolic lead inlays were crafted as early as the first half of the nineteenth century by the Sioux, and even earlier by some of the Great Lakes Indians. But effigy pipe sculptures as elegant and fragile as those shown here, one with and the other without lead decoration, would not have been practical for frequent ceremonial use under the old conditions of almost constant travel. Most such pipes were made in the last quarter of the nineteenth century under the enforced idleness of reservation life and were created as works of art rather than for personal use. Still, the subject matter was usually traditional and often spiritual. Birds were messengers of the superior powers or themselves embodied the Mysteries. If the bear astride the leaping horse seems at first whimsical, one need only recall the overwhelming economic and metaphysical importance of the horse in Plains culture and the great potency ascribed to bear medicine to realize that mystery power more than humor must have been on the Sioux artist's mind. Crane pipe: 4¾ inches long. Private collection. Bear and horse pipe: 5⅞ inches long. Private collection.





ered neutral territory, where anyone might come in peace and safety to mine pipestone for themselves or for trade. Indeed, pipestone carvings and pipe bowls from the Minnesota quarry have been found as far away as upstate New York, in Iroquoian sites dating to the seventeenth century. But by the mid-nineteenth century the Sioux had become sole owners of the sacred site, compelling other Indian nations to purchase the raw pipestone or finished bowls from them.

The red stone is named for the painter-ethnographer George Catlin, who left his comfortable life as a Philadelphia society portrait painter to become one of the foremost recorders of mid-nineteenth century Indian life. Catlin's name came to be identified with the stone not because he was the first white man to see it (others had preceded him to the quarry) but because he was the first visitor with the scientific curiosity to take samples of the rare and distinctive red mineral back East for identification and analysis.

Catlin described in his letters some anxious moments in Sioux custody in 1832 before the chiefs permitted him to continue to the fabled source of the sacred red stone. He was told by them that long ago the Great Spirit himself had come to the quarry to carve himself a pipe, and that it was from him that the Dakota learned that the red stone was part of their own flesh and blood—and hence their rightful property. As Lame Deer learned the story from his grandfathers, a great flood in ancient times drowned the plains and prairies, overturning the earth and crushing all the people beneath it. The only survivor was a young woman whom an eagle swooped up and deposited on the peak of a high mountain. There she gave birth to the twins that became the ancestors of a new Sioux race. The blood of the victims of the deluge, meanwhile, jelled, hardened and finally was transformed into the sacred red pipestone.



Above: What makes this early nineteenth century human-effigy pipe bowl unusual is not its form, which is characteristic of some Great Lakes pipes of this period, but its material. The pipe was not made of steatite, a mineral commonly used in this area, but was carved in one piece from a rough casting of metal—an alloy of lead and a small amount of tin. Marks on the pipe indicate that the artist worked the soft metal with file and knife and polished it just as though it had been stone. That the seated Indian faces the smoker suggests that he was the owner's guardian spirit, or perhaps the owner himself. Length: 5 3/16 inches.

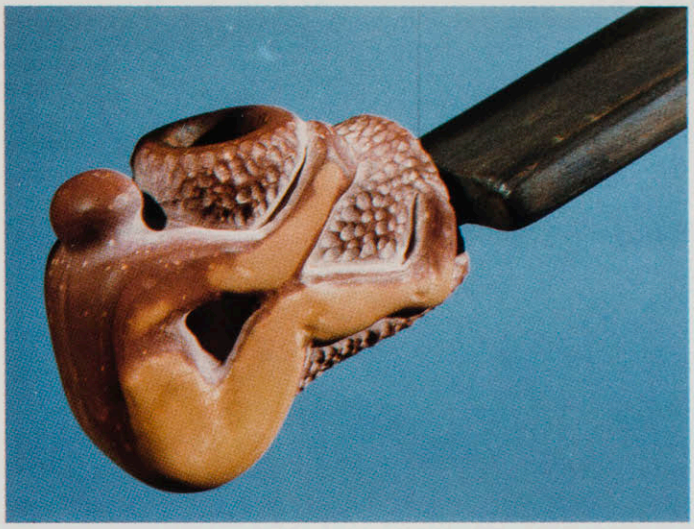
Right: The massive proportions and great weight (12 1/2 inches long and almost 2 pounds in weight) of the old Northern Plains pipe bowl at the top, and its equally bulky wooden stem, almost certainly mark it as a powerful "medicine bundle" that would have been unwrapped and smoked only on extraordinary occasions. The thickness of the catlinite seams at the sacred quarry in Minnesota and the great spiritual and economic value of the mineral ordinarily limited the size of pipe bowls; the smaller bowl on the pipe at the bottom more nearly represents the average size of Plains pipe bowls. Top: 30 inches long, Northern Plains, ca. 1840, private collection. Bottom: 22 inches long, Sioux, ca, 1880, private collection.

Carving a pipe from catlinite was no easy task, technically or spiritually. The stone was imbued with such potent mystical properties that the quarry and its product had to be approached in a purified state with respect, humility and offerings. A hard quartzite overburden eight to ten feet thick (the well-known "Sioux quartzite," a favorite building material to this day) had to be broken up, and the fragile pipestone, which is found in layers that are up to a foot thick and extend for about a mile beneath the surface, had to be removed from intervening deposits of shale. The rough pieces of pipestone were cut to the desired size with flint and string saw. Then the bowl was drawn on the stone and the excess cut away. Each task was begun with a prayer—indeed, says Lame Deer, the very designs on the bowl were prayers.

The Indian artists of the past used



Right: Modern effigy pipe of catlinite, by the well-known Sioux sculptor Earl Eder. Length: 3 inches. Private collection.



Below: This human-effigy pipe bowl from the second half of the eighteenth century is carved of hardwood and inlaid with lead. Length: 6½ inches. Great Lakes region. Private collection.



wood, antler, flint, and—after the coming of the European traders—knives to drill and ream out the bowl and its stem. The bowls were shaped and polished with flint, quartzite and fine sand. Buffalo tallow and other animal fats gave the finished piece its polish. Nowadays more modern tools, including saws, hand drills and sandpaper, are employed by the Indian pipecarvers, who retain exclusive rights to mine and utilize the precious—and to them still sacred—catlinite.

The bowl of a pipe represents only half the technology and half the ideological dimension. Stems were at least as important, materially as well as philosophically. Indeed, in many cases, they were accorded greater respect than the finest bowl. Bowls were essential for burning the smoking mixture (usually not tobacco by itself but a blend of vegetable materials based on red willow bark, known as *kinnickkinnick*). Stems, however, could have different uses apart from the pipe, as prayer wands and dance staffs and in ceremonial exchanges.

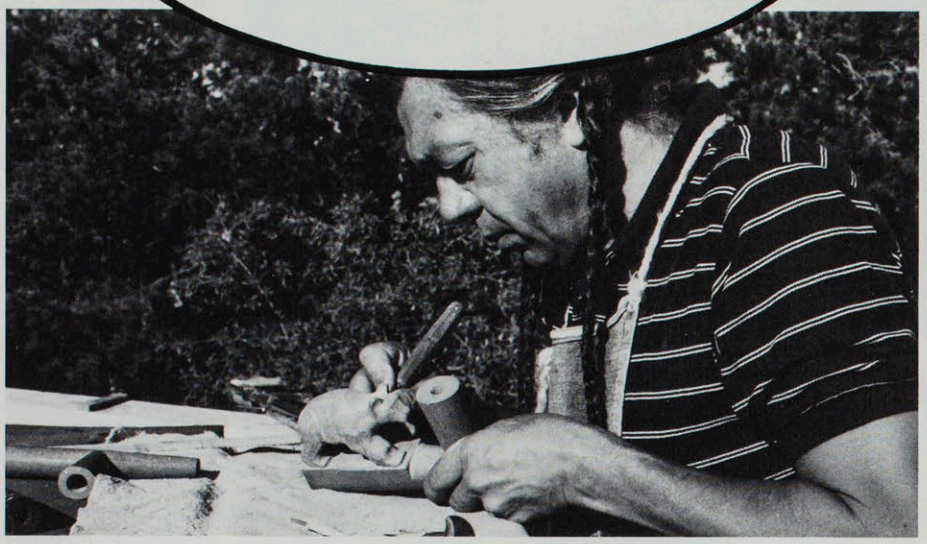
Two main techniques were employed in making a wooden stem. Originally, a straight piece of ash or some other hard wood was carefully shaped into the desired form, round or flat. It was then split lengthwise, and the two halves were hollowed out and glued back together. (The same method, by the way, was also employed by South American Indians in the manufacture of the much longer, slender blowgun.) With the advent of metal wire, the soft core could be burned out without the need for splitting. This was relatively easy with short stems but required far more patience and skill for stems reaching four or more feet in length, such as those of some especially sacred and powerful calumets. The Indians were also ingenious in adapting other European tools to their purposes. For example, hot files were widely and skillfully employed in finishing both flat and round stems with a distinctive patterned burnish.

Some stems appear simple and utilitarian, but others are true works of art, especially the flat, open-work "puzzle stems." Only the carver of a puzzle stem knew the precise pathway of the smoke as it zig-zagged from bowl to mouthpiece, avoiding the symbolic or decorative designs that he had carved out of the stem. The stem was first split horizontally, and the complicated passageway for the sacred smoke was hollowed out on the interior surface of the two halves. The halves were then glued back together, with the carver taking extreme care to obliterate any sign of the seam.

At least as ingenious are the spiralling stems, which made their initial appearance in the repertoire of the Plains and Great Lakes pipemakers in the first half of the ninteenth century. Here, too, sev-

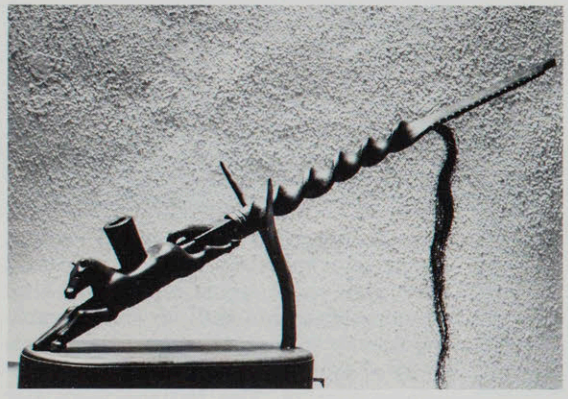
PIPES AND PIPEMAKING

The Traditions are alive!

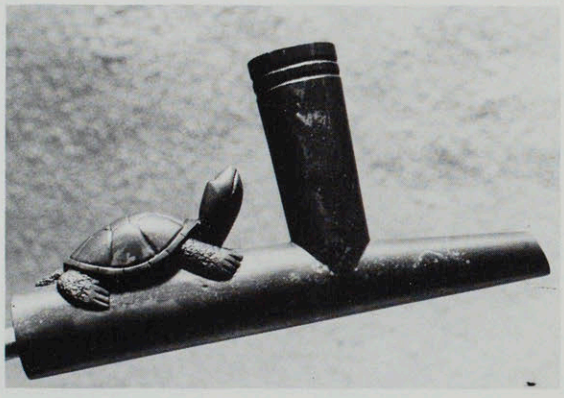


Left: Chippewa pipe carver Adam Fortunate Eagle Nordwall at work sculpting one of the bear effigy pipes for which he has become famous. He employs much the same simple tool kit used by Plains Indians since the time that white traders introduced steel.

Below: "Traditional Pipe," a bronze sculpture by Fortunate Eagle, cast from his original of red pipestone (catlinite) and wood. Only 36 pieces were cast before the mold was destroyed. Length: 33 inches. Private collection.



Right: Effigy bowl of red pipestone of traditional design by Fortunate Eagle. The turtle, like the red pipestone, has long been sacred to many North American Indians. On the old effigy pipes, such animals generally portrayed their owner's guardian spirits. Length: 8 inches. Private collection.



The sacred pipe and the ceremonial smoking rituals remain powerful, integral elements of living Indian culture. Modern Native American artists carve pipes of red pipestone not just as works of art or as souvenirs but for actual use in religious ceremonies. In fact, one of the foremost Indian pipe sculptors today, the Chippewa Adam Fortunate Eagle Nordwall, carved hundreds of pipes of traditional shape for medicine men and other fellow Indians before his work was discovered by non-Indian art dealers and collectors.

Fortunate Eagle was born in 1935 on the Red Lake Reservation in Minnesota. He first learned about the sacred pipe and pipemaking when he was sent off at age 5 to the Pipestone Indian Boarding School in southwestern Minnesota. "The government sent us to these boarding schools to 'educate' us away from our native ways and assimilate us into the dominant culture," he recalls. "We were not allowed to speak our own langauge, for example — in fact, we were punished for doing so. But, at least in my case, the plan misfired. You see, the school was on the same land as the sacred quarry where Indians had been coming for centuries to mine the material for our pipes. As a kid, I met many of the old pipemakers. I first learned from them how to shape the sacred stone, which symbolizes our Mother, the Earth, and how to carve the wooden stems, which represent all the plant beings, all the things that grow from our Mother."

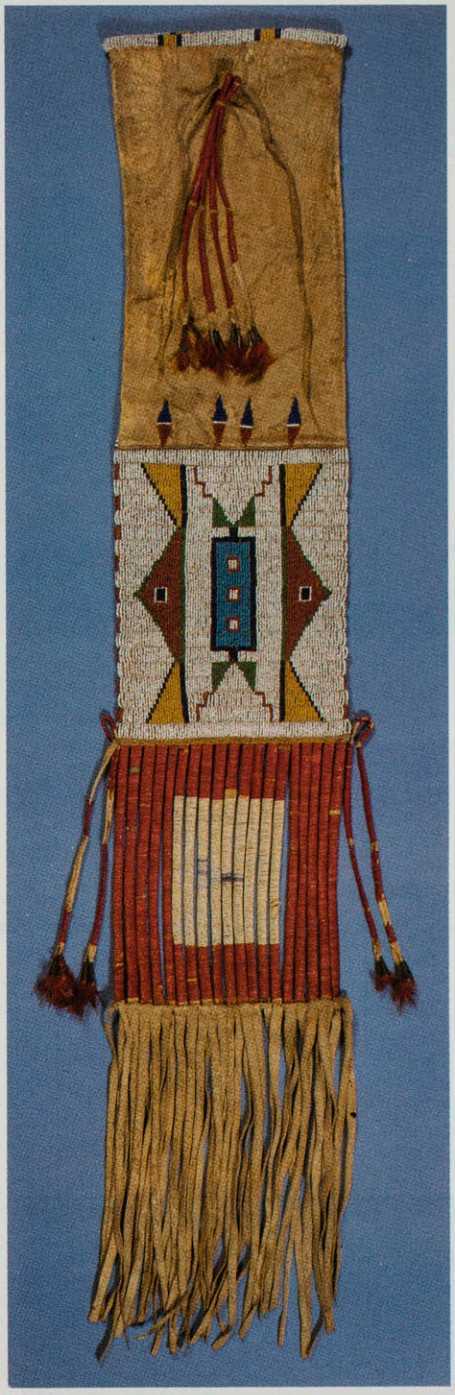
As an adult, Fortunate Eagle had a long, successful career in business in the white man's world. But, in the early 1970s, he was designated an official "pipeholder," one who can conduct pipe ceremonies, and he has since resumed his work as an artist full time. He now lives with his Shoshone wife Bobby on the Shoshone reservation at Fallon, Nevada, where he also has his studio. His splendid pipes, which have only recently been exhibited in galleries, are in great demand among collectors.

Fortunate Eagle will be one of the artists demonstrating their techniques at the 12th Annual American Indian Festival at the Natural History Museum December 7th through 12th. He will also be on hand the evening of December 6th to discuss his work with Museum Members at the opening of the Festival and the Members' preview of the exhibit, Finished in Beauty: Southwest Indian Silver from the Doneghy Collection.

eral techniques were employed. One was to carve and drill a flat stem and then, presumably with the aid of heat, water and steam, patiently twist a portion of it into a perfect spiral that might extend all the way or partway from mouthpiece to bowl. Needless to say, it required much time and skill to achieve a perfectly straight, evenly spaced series of twists in the hard wood. Another technique was to sculpt the spiral with knife and hot file into the surface of a round stem. Occasionally, the artist outdid himself, creating not just a single but a double spiral. However admirable as works of art, such stems were more than just a display of the woodcarver's virtuosity. Spirals were and still are of great importance as symbols of new life and rebirth, especially in the shamanistic Midewiwin or medicine lodge initiation rituals of the Great Lakes Algonkians, some of whose sacred imagery also spread to their Plains and Prairie neighbors, including the Sioux.

As important and fraught with sacred power as were bowl and stem, a pipe was not considered to be supernaturally charged or activated until the two pieces were joined. When the pipe was not in use, bowl and stem were taken apart and stored in a specially decorated bag. The symbolic charging of the pipe for ritual use was clearly related to the pervasive emphasis on male and female complementarity and unity. The bowl, its form and material a gift of Mother Earth, was female; the stem, with its phallic connotations and its origin from the tree as *axis mundi*, was male. The female bowl was carved by the man, while the woman had the responsibility of embellishing the male stem. According to Catlin, the decorating of a long, flat wooden stem of a calumet with dyed and split porcupine quills and other decoration could take months. He observed that the wife of a Cheyenne chief whose portrait he painted had spent more than a year dressing her husband's ceremonial pipe, which was so precious to the chief that he then refused to part with it for any price.

No discussion of the pipe would be complete without attention to the appearance and rapid perfection of sophisticated Native metallurgical techniques to embellish and sometimes repair pipe bowls of stone or even wood. Cold hammering of copper into a variety of ornaments, tools and weapons was practiced in prehistoric times. But it was Europeans who first introduced Native Americans to the smelting and casting of lead, pewter, brass and iron. The Indians began to channel and inlay steatite or catlinite pipes with lead, alloys and even pewter, and the technique spread in the last half of the eighteenth century and the early decades of the nineteenth century through the midwestern Woodlands and the northern and central Plains.



Sioux pipe bag of tanned, beaded and quilled hide. Bowls and stems were separated and stored in such bags; only when they were joined for ceremonial smoking did the pipe become charged with the requisite supernatural potency. Length: 43 inches. Natural History Museum of Los Angeles County.

Metal was used for forged or cast "tomahawk" pipes that combined a small smoking bowl with a hatchet. Most were of European manufacture and had been traded to the Indians, who fitted them with perforated wooden handles that served both as pipestems and as hafts for these largely ceremonial, rather than functional, weapons. However, Indians in both the eastern and mid-western Woodland had learned the art of smelting ores from the English, French and Dutch, and some tomahawk pipes were actually the work of Native American smiths. So were some cast all-metal pipes based on Native prototypes of fired clay. Such pipes have been found in Iroquoian sites dating to the mid to late seventeenth century. Toward the end of the seventeenth century, French artisans appear to have introduced the Sauk and Fox then living in Illinois and Wisconsin to the art of mining and smelting lead ore. Thereafter these Algonkian-speakers began to produce lead ingots for trade not only to whites but to other Indians, who used the metal to make shot for their newly acquired firearms, to repair stone pipe bowls, and for channel inlays.

To prepare a stone bowl, whether of catlinite, steatite or slate, for metal inlay work, the carver cut a channel in the desired pattern, placed the bowl in a mold, and poured in the molten lead. The mold was removed, the excess metal was cut away, and the channel was polished down to the level of the stone. The fit between metal and stone is often so close that no seam is visible.

Some of the Indians experimented with lead alloys to achieve a greater hardness or intensity of color and brightness. The well-smoked all-metal effigy pipe illustrated here (page 14) is particularly interesting in this respect because it blends Native style and stone-carving technology with new knowledge of the properties of metals. The general style of the pipe—its characteristic flaring bowl, pointed projection in front, and perforated fin—places it early in the 1800s. Human effigies of similar style, with knees drawn up and wearing the characteristic roach, are also represented in stone. This is not the only all-metal pipe of this general shape surviving from the early nineteenth century, but other examples known to us are embellished with geometric rather than life forms. The human figure faces the smoker (or, when the pipe is offered in the traditional manner to the superior powers, the spirits) and almost certainly represents either the owner himself or his guardian spirit.

One might have expected such a pipe to have been cast at least into its rough form and then finished by cutting and polishing. Instead it seems to have been



Beginning around 1870, a Yankton Sioux who had been brought to Fort Yates on the Grand River Reservation in North Dakota as a prisoner of the U.S. Army was inspired to carve a unique new kind of pipe stem embellished with the images of animals considered especially sacred and powerful by the Indian people. Among these animals were elk, buffalo, fox, turtle, bighorn sheep, lizard, and certain birds. According to Paul Dyck, a leading authority on the Sioux, this carver's fine stems, like this well-smoked example dating to his early period, soon achieved great renown because of their special spiritual potency. A number of famous chiefs and medicine men, including Sitting Bull and Red Cloud of the Sioux and even Chief Joseph, the heroic leader of the Nez Perce, adopted these pipes as personal smoking instruments. Eventually, beginning in the 1880s, such pipe stems were also made to be presented to a few favored whites who had given some service to the Indians; later still, a number were sold for much-needed cash. There were also some imitators of the Yankton carver, but his work is easily distinguished by his "signature," the raised head and finished feet of his turtles. This particular pipe, carved of ash, is unusual because each animal head is set off by a small round knob on the upper side of the stem and a larger knob on the underside. Length: 23½ inches. Private collection.



entirely carved and drilled from an ingot or metal blank with knife and file using the same techniques employed on stone. X-ray analysis shows it to be an imperfect alloy containing 80 percent lead and 20 percent tin. The low ratio of tin to lead disqualifies the material as pewter, which from the seventeenth century on has been predominantly tin with very little or no lead. So does the absence of antimony, which a white pewterer would have added as a hardening agent. Hence, there is no doubt that the maker was indeed an Indian.

We know nothing of how Indians fit metallurgy into a world view that recognized in stone the bones of Mother Earth. But of course ore is kindred to stone, and its metamorphosis and purification by fire should have presented no conflict in an ideology of transformation. Still, a Sioux would probably have found an all-metal pipe bowl incompatible—to him the proper and sacred material for sending smoke to the spirits and for receiving their power in return was above all the red stone that was the petrified lifeblood of his people and the sacred buffalo. When as a youth Lame Deer went on the lonely and terrifying quest for his first vision, it was his red-stone pipe that made the living connection between him and his forefathers and the spirit world and that helped him endure hardship and a terrible fear of the unknown:

> As I ran my fingers along its bowl of smooth red pipestone, red like the blood of my people, I no longer felt scared. That pipe had belonged to my father and to his father before him. It would someday pass to my son and, through him, to my grandchildren.... As I fingered the pipe, touched it, felt its smoothness that came from long use, I sensed that my forefathers who had once smoked this pipe were with me on the hill, right in the vision pit. I was no longer alone.

The authors adapted this essay on the sacred pipes of Plains Indians for TERRA from their recent book, NORTH AMERICAN INDIAN ART (Rizzoli International). They are both on the Anthropology faculty of the State University of New York at Albany. Peter T. Furst is a long-time collaborator of the Natural History Museum, where he curated two exhibitions, on Huichol art and pre-Columbian gold, respectively, and where he has been a Research Associate since 1964. He received his Ph.D. from UCLA in 1966. Jill L. Furst, an expert on the prehispanic Mexican codices and Meso- and North American Indian and Spanish Colonial religion and art, earned her doctorate at the University of New Mexico in 1977.



Courtesy of Sea World, Inc.

GRAY WHALES

by SAMUEL A. McLEOD
and LAWRENCE G. BARNES

The crowd gasped in awe at the sight of a gray whale off the bow of their whale-watching boat cruising off the Palos Verdes peninsula. The passengers were among the privileged few who see a living whale. But gray whales are not rare along the Pacific coast of North America from about November to April because that is when they migrate from the Arctic down to Baja California and back again, hugging the coast most of the way.

It is a treasured spectacle to witness this migration of one of the largest animals ever to inhabit the earth. Given their coastal habits it is perhaps surprising that gray whales were not exterminated by early whalers. In fact, this may have been the fate of the Atlantic populations. Whalers in the 19th century had nearly hunted the eastern Pacific gray whale population to extinction, but protection since 1946 has allowed this population to increase its size to at least 13,000 animals. As yet there is no agreement whether this number is close to the original size of the eastern Pacific stock. In addition to the eastern Pacific population of gray whales, which migrates along the western coast of North America, there is probably a much smaller western Pacific population, which summers in the waters off Siberia and migrates along the Korean coast.

In spite of its accessibility and increased abundance, the gray whale is still poorly known. There is only one known specimen of a fossil gray whale, and surprisingly few specimens of modern gray whales are in museums. We do not know whether certain differences between specimens reflect variations due to age, sex, different populations, or are just individual differences. We do not know exactly how they feed or how often.

The gray whale is placed in its own family, the Eschrichtiidae, in recognition of the considerable differences between it and the other groups of baleen whales. It has a curious mixture of primitive and derived characters compared to other mysticetes (baleen whales). Its skull is arched more than that of the balaenopterids (rorquals, including the blue, fin, minke, and humpback whales) but less than that of the balaenids (right whales and bowheads). There is a series of low knobs along a gray whale's back, whereas the balaenids and neobalaenids (pygmy right whale) have none and the balaenopterids have a well-developed dorsal fin. Gray whales have two to four throat grooves, far fewer than the balaenopterids but more than the smooth-throated balaenids and neobalaenids.

Gray whales have a number of unique characters, including enormous nasal bones and a complex manner in which the bones of the snout connect with those of the brain case. Overall, gray whales are not closely related to any of the three other modern baleen whale families or to any of the extinct cetotheres.

In contrast to the other baleen whales,



The fossil gray whale skeleton lying upside down as exposed at the discovery site. The tip of the snout is toward the viewer, and the skeleton was cut off behind the ribs when the slope was graded.



Museum staff and volunteers begin covering some bones with plaster and burlap jackets prior to removal.

the gray whales are shallow water bottom feeders. They apparently stir up mud on the ocean bottom with their snout or flippers and then filter out the invertebrates from the water. The shallow water continental shelf areas of the Arctic are the gray whale's feeding grounds. In winter, however, these areas are covered with ice, forcing the gray whales to move elsewhere.

Being shallow water animals, gray whales seek warm and shallow water embayments where they can breed and give birth. In the eastern Pacific these breeding and calving grounds are along the coast of Baja California, particularly at Laguna Ojo de Liebre (Scammon's Lagoon), although in historical times San Diego Bay was also a calving area. The round trip from the summer feeding grounds in the Arctic to the winter calving grounds in Baja California and back again is about 18,000 kilometers (over 10,000 miles). This is the longest migration of any mammal, and its total distance is exceeded only by that of the Arctic tern, which migrates from the Arctic to the Antarctic.

In October the gray whales start moving south from their northernmost feeding grounds, and they arrive in Baja California during December and January. In late February they begin the return journey, arriving at their feeding grounds from April to June.

During this period those of us who live on the west coast of North America are treated to one of nature's spectacles. Sighting gray whales during their migrations cannot fail to be exciting, and we are fortunate that the event is accessible to so many of us. At several promontories that project out into the Pacific Ocean gray whales pass so close that they are easily visible from the shore. The more notable of these vantage points are Point Reyes north of San Francisco, Point Arguello and Point Conception west of Santa Barbara, Point Vicente on the Palos Verdes peninsula and Point Loma near San Diego. Whale watching is now very popular and supports a considerable seasonal industry from December through March in southern California.

Until 1937 the gray whale was known to science under the name *Rhachianectes glaucus*. In that year two zoologists discovered that some subfossil bones (bones that are younger than the Pleistocene Epoch or "Ice Age") from Europe, called *Eschrichtius robustus*, belonged to the same species as the living gray whale from the Pacific. Because the subfossil bones were described in 1861 whereas the living gray whale was not described until 1868, the name applied to the subfossil bones has priority. Unfortunately, the zoologists called the species *Eschrichtius gibbosus*, believing the gray whale to be the same species as the "scrag whale" described by a New England whaler, Paul Dudley, in 1725. But the subfossil bones are preserved in a museum for scientists to reexamine, whereas there are no specimens of Dudley's "scrag whale," only a written account. Most zoologists, therefore, acknowledge that the "scrag whale" is not identifiable without a specimen, and so the gray whale, including subfossil remains from an extinct Atlantic population, is currently known as *Eschrichtius robustus*.

During the latter part of the 19th century several species of fossil whales were assigned to the genus *Eschrichtius*, but this did not carry the connotation that they were fossil gray whales because that name was not used for the living gray whale until 1937. Nevertheless, a review of those species by us has shown that they are not gray whales either because they are too fragmentary to be assigned to a given species or because they actually belong to some other genus of whales.

Subsequent to the initial discoveries of bones in Europe, other subfossil specimens have been discovered. Several of these were stored by museums for many years before being recognized as gray whales. Most are from the Atlantic coast of the United States. Surprisingly, no subfossil specimens are known from the Pacific coast, where the gray whales live today. This is probably because the rocky beaches and steep ocean cliffs on the Pacific coast are less favorable to the preservation of skeletons than are the flat coastal plains and sandy, shallow water embayments of the Atlantic coast.

One of the subfossil specimens from Long Island, New York, has been dated using the radiocarbon method as being from an animal that died sometime after 1675. But there are no unequivocal references to gray whales in the literature of early European or American whalers. If the now-extinct Atlantic populations were still in existence in the late 17th century or early 18th century, then why were they not noticed? Because the Gulf Stream warms the Atlantic waters off North America, the gray whale may have calved in slightly more northern waters. The southernmost subfossil specimen is from Myrtle Beach, South Carolina.

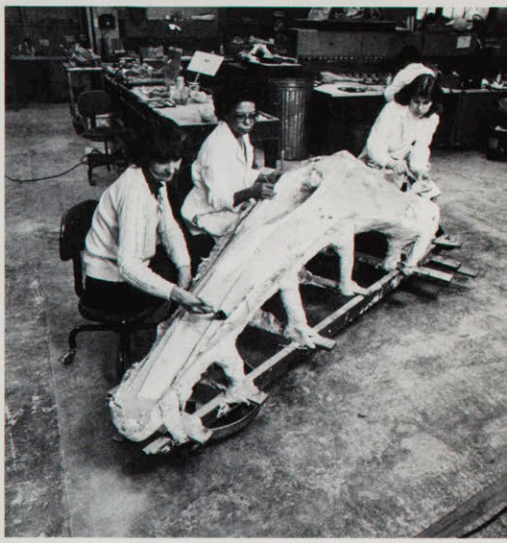
In 1970 the first true fossil gray whale was discovered in San Pedro, California, by Mr. Paul R. Kirkland of Los Angeles. The specimen was collected early in 1971 in a cooperative effort by volunteers,



The plaster-encased skull is loaded onto a Museum truck before being transported to Los Angeles.



The well-braced plaster-encased vertebral column is lifted onto the Museum truck.



Museum volunteers Diana Weir, Pat Tyus, and Hilary Hicks, left to right, clean the fossil skull in the Museum laboratory prior to scientific study and display.

students, and staff from Carson High School, Harbor College, California State University at Northridge, Cabrillo Beach Museum, and the Natural History Museum. The skeleton was located on property owned by Westoil Terminals Company, which offered assistance in collecting it and then donated the specimen to our museum.

The skeleton was nearly complete, lacking only the tail vertebrae, which had been cut off by tractors, and the lower jaws. The skeleton was lying upside down, a typical position for fossil whales because as an animal decomposes, gases in the bloated abdomen cause the carcass to float upside down. For the most part the bones were still articulated, indicating that the skeleton settled in quiet water rather quickly after the animal decomposed. This burial was not before the lower jaws became detached, however, and currents must have transported them elsewhere. There are several shark we cannot determine whether these were caused by sharks attacking the still-living whale or scavenging on the carcass. Many impressions of clam shells were found around the specimen, and a fish skeleton was found on the shoulder blade.

The whale skeleton was found in the San Pedro Sand, a shallow water formation that is Late Pleistocene in age. Geologic and paleontologic data suggest it is between 50,000 and 120,000 years old and therefore much older than the subfossil specimens from the Atlantic coasts, but it is still quite recent compared to most fossil whales. For this reason we are not surprised that the skull shows no species differences from modern gray whales; and we have therefore assigned it to the living species, *Eschrichtius robustus*.

We are still perplexed as to why there are no other occurrences of fossil gray whales. The anatomical differences between them and other baleen whales are so significant that they must have had a separate lineage for several millions of years. Moreover, their shallow water habitat should prove more favorable to their preservation as fossils. Nonetheless, our museum's specimen remains the only true fossil gray whale yet known.

The massive skeleton was warehoused by the Museum until priorities allowed for a plan to prepare, study, and display it. Most of the preparation work was done by Ms. Pat Tyus, honored by the Museum Alliance with the Vertebrate Paleontology "Volunteer of the Year Award" in 1982. Other volunteers, including Angela Bennett, Joan Brown, Hilary Hicks, and Diana Weir, assisted Pat in carefully removing the sandy matrix from the skull. Although the sand grains were not cemented into rock and could be scraped or brushed away, the bones were very fragile and tended to crumble. Thus great caution was necessary in removing the matrix and in hardening the bones during cleaning.

After the skull was prepared, measured, photographed, and studied, it was placed in the Museum's California Fossil Hall, where it is currently exhibited. Some bones of the front flippers were prepared by Dr. Eugene Fritche and his students at California State University at Northridge. In 1982 these and other bones were placed on display in the Costa Mesa Fedco Department Store as part of an exhibit on gray whales. The remaining vertebrae and ribs will remain at the Museum's warehouse until we obtain help in preparing them.

Dr. Samuel A. McLeod is Assistant Curator of Vertebrate Paleontology, currently employed by the Natural History Museum as a Collections Manager for a National Science Foundation grant to our museum. His doctoral research was on evolution of echolocation and feeding mechanisms in whales, and he has current research interests in a variety of topics on the biology and paleontology of marine vertebrates.

Dr. Lawrence G. Barnes is Curator of Vertebrate Paleontology at the Natural History Museum. His duties include curating and studying the Museum's large collection of fossil marine mammals, and he has written several articles and book chapters dealing with fossil sea lions, cetaceans, and other marine vertebrates.

Some of the information in this article is summarized from a book soon to be published by Academic Press, entitled, The Gray Whale. The lead chapter, "The evolutionary relationships and fossil record of gray whales," is authored by Drs. Barnes and McLeod. Other chapters in the book cover such topics as migration and feeding behavior.

BAJA CALIFORNIA WHALE WATCHING TRIP

Museum Members have an opportunity to see gray whales up close on annual Baja California cruises sponsored by the Natural History Museum. Dr. Barnes and Dr. Gary Wallace, Curator of Botany, will be the scientific leaders of the next cruise, which is scheduled for February 11 to 18, 1984. For further information and reservations for the trip, call Judy Astone in the Membership Office, 213/744-3426.

THE GREGORIAN 400

by TOM SITTON



Pope Gregory XIII established the Gregorian Calendar in 1582.

In the summer of 1984, athletes from around the world will gather in Los Angeles to participate in the games of the XXIII Olympiad. Probably they will arrive several weeks before the games in order to hone their skills in practice. It seems certain that all of them will plan to have more time for on-site practice than the United States Olympic team of 1896, which arrived in Athens just one day before the opening ceremonies.

Why did the Americans arrive so late for the first modern Olympic games? Did they miss their ship or make bad connections? Actually, they were on time, according to their own calendar. The Olympic games, however, were scheduled to begin according to the calendar in Greece, which was twelve days ahead of those used in most other parts of the world. The Americans had not been aware of this.

The reason for the discrepancy in calendar dates can be traced to an event that occurred just over four centuries ago. Following the recommendations of an international commission of the world's leading mathematicians and astronomers, and working with the advance approval of most of the Christian rulers of Europe, Pope Gregory XIII proclaimed 1582 as the Year of Correction of the Julian Calendar, which had been used in Europe since 45 B.C.

According to the newly adopted Gregorian system, the errors in the Julian Calendar were corrected in that year by dropping ten days from the month of October, so that October 4, 1582, was followed by October 15. Henceforth, the leap year day in three of every four centurial years (for example: 1700, 1800, and 1900) would be omitted to make the calendar more accurate and to prevent the eventual celebration of Easter in the summertime.

For religious and political reasons, most of the Protestant countries of Europe refused to go along with the change or adopted the new system only after years of discussion. Most of the German states adopted the Gregorian Calendar in 1700, while Russia, Greece, China, and Turkey did not make the change until the twentieth century. The wide variety of years (and centuries) in which different nations accepted the Gregorian Calendar over the last four hundred years resulted in the confusion we have today in determining the exact dates for many past events.

The Gregorian system was established in the major portions of the United States in two years separated by almost two centuries. In New Spain, the new calendar became effective in 1583, when King Philip II ordered the change to be made in his American dominions. In the East, the thirteen British colonies that became our first states adopted the Gregorian Calendar when Great Britain converted to the new system in 1752. By this time, the Julian Calendar was eleven days ahead of the Gregorian system, so the eleven days between September 2 and September 14 disappeared from the almanacs of that year. The change was greeted with rioting in London as protesters cried: "Give us back our eleven days." But at least one British subject found a salutary effect of the change: Benjamin Franklin wrote in his *Poor Richard's Almanack* for 1752, "what an indulgence is here, for those who love their pillow to lie down in Peace on the second of this month and not perhaps awake till the morning of the fourteenth."

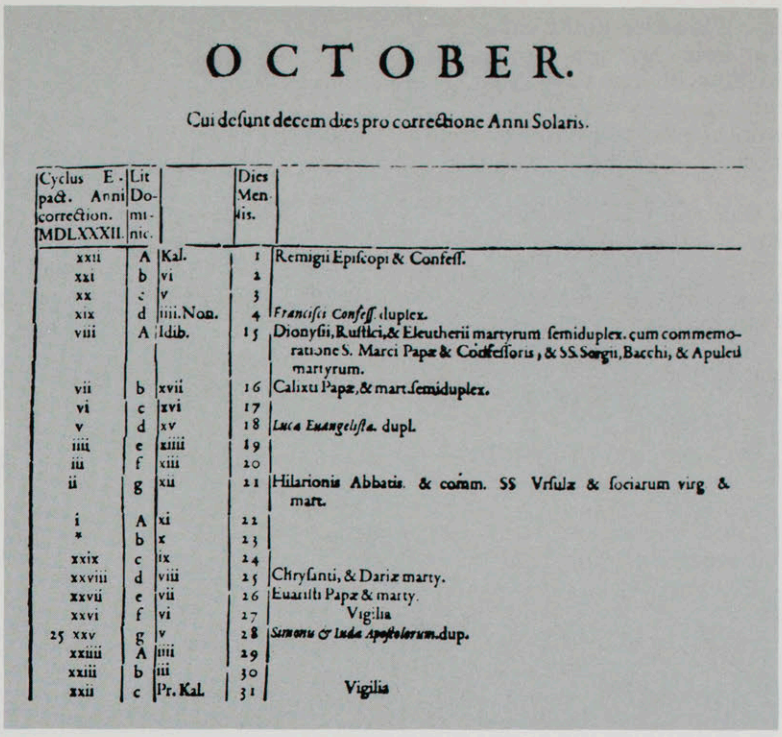
The confusion of dates in American colonial history that occurred before 1752 is best illustrated by our national observance of the birthday of our first president, George Washington. Washington was born on February 11, 1731, under the Julian system, when Great Britain and its colonies began the year on March 25. When Great Britain adopted the Gregorian Calendar in 1752, it also changed the style of its calendar, moving the beginning of its year from March 25 to January 1. So, Washington's birthday not only became February 22, because of the deletion of eleven days, but the year in which he was born became 1732, since February became the second month of the year rather than the eleventh.

The change to the Gregorian Calendar has created problems for other nations as well. In the Soviet Union, the overthrow of the Provisional government of Alexander Kerensky by the Bolsheviks is a hallowed date. Hailed as the "October Revolution," this incident actually occurred in November 1917, according to our present calendar, since Russia did not

adopt the Gregorian Calendar until 1918.

The Gregorian system was an improvement over the Julian Calendar, but it is still about 26 seconds too long each year. It is also an inconvenient system for business procedures since the twelve months are composed of various numbers of days. In 1793, French revolutionaries tried to correct the Gregorian Calendar by adopting a "calendar of reason." This system included twelve months, each of which contained three weeks of ten days. The "calendar of reason" idea was never really accepted by the French people, since it ignored the Sabbath and resulted in only one day of rest every ten days. In 1806, Napoleon Bonaparte abandoned this experiment, and France adopted the Gregorian Calendar for the second time.

In the twentieth century, several proposals have been considered as alternatives to the Gregorian Calendar. The International Fixed Calendar, a proposal that was popular in Europe in the 1920s, consisted of thirteen months of 28 days each, with every month beginning on a Sunday. An additional day without a



OCTOBER.

Cui deſunt decem dies pro correctione Anni Solaris.

Cyclus E. pact. Anni correction. MDLXXXII.	Lit Dominic.		Dies Mensis.	
xxii	A	Kal.	1	Remigii Epiſcopi & Confeſſ.
xxi	b	vi	2	
xx	c	v	3	
xix	d	iiii. Non.	4	*Franciſci Confeſſ.* duplex.
viii	A	Idib.	15	Dionyſii, Ruſtici, & Eleutherii martyrum ſemiduplex. cum commemoratione S. Marci Papæ & Confeſſoris, & SS. Sergii, Bacchi, & Apuleii martyrum.
vii	b	xvii	16	Calixti Papæ, & mart. ſemiduplex.
vi	c	xvi	17	
v	d	xv	18	*Lucæ Euangeliſtæ.* dupl.
iiii	e	xiiii	19	
iii	f	xiii	20	
ii	g	xii	21	Hilarionis Abbatis. & comm. SS Vrſulæ & ſociarum virg. & mart.
i	A	xi	22	
*	b	x	23	
xxix	c	ix	24	
xxviii	d	viii	25	Chryſanti, & Dariæ marty.
xxvii	e	vii	26	Euariſti Papæ & marty.
xxvi	f	vi	27	Vigilia
25 xxv	g	v	28	*Simonis & Iudæ Apoſtolorum.* dup.
xxiiii	A	iiii	29	
xxiii	b	iii	30	
xxii	c	Pr. Kal.	31	Vigilia

One of the shortest months in the last four hundred years was October 1582. Pope Gregory XIII eliminated ten days of that month to correct the Julian Calendar.

The World Calendar

JANUARY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

FEBRUARY						
S	M	T	W	T	F	S
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..

MARCH						
S	M	T	W	T	F	S
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

APRIL						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

MAY						
S	M	T	W	T	F	S
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..

JUNE						
S	M	T	W	T	F	S
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

*LEAP DAY
SATURDAY, JUNE 30.2

JULY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

AUGUST						
S	M	T	W	T	F	S
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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..

SEPTEMBER						
S	M	T	W	T	F	S
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10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

OCTOBER						
S	M	T	W	T	F	S
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

NOVEMBER						
S	M	T	W	T	F	S
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..

DECEMBER						
S	M	T	W	T	F	S
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

*YEAR DAY
SATURDAY, DECEMBER 30.2

International Fixed Calendar

JANUARY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

FEBRUARY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

MARCH						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

APRIL						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

MAY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
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15	16	17	18	19	20	21
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JUNE						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

*LEAP DAY
JUNE 29

SOL						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

JULY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

AUGUST						
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1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

SEPTEMBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

OCTOBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

NOVEMBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

DECEMBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

*YEAR DAY
DECEMBER 29

The underlined dates indicate the quarters of the year.
**These new days are without any week-day name.*

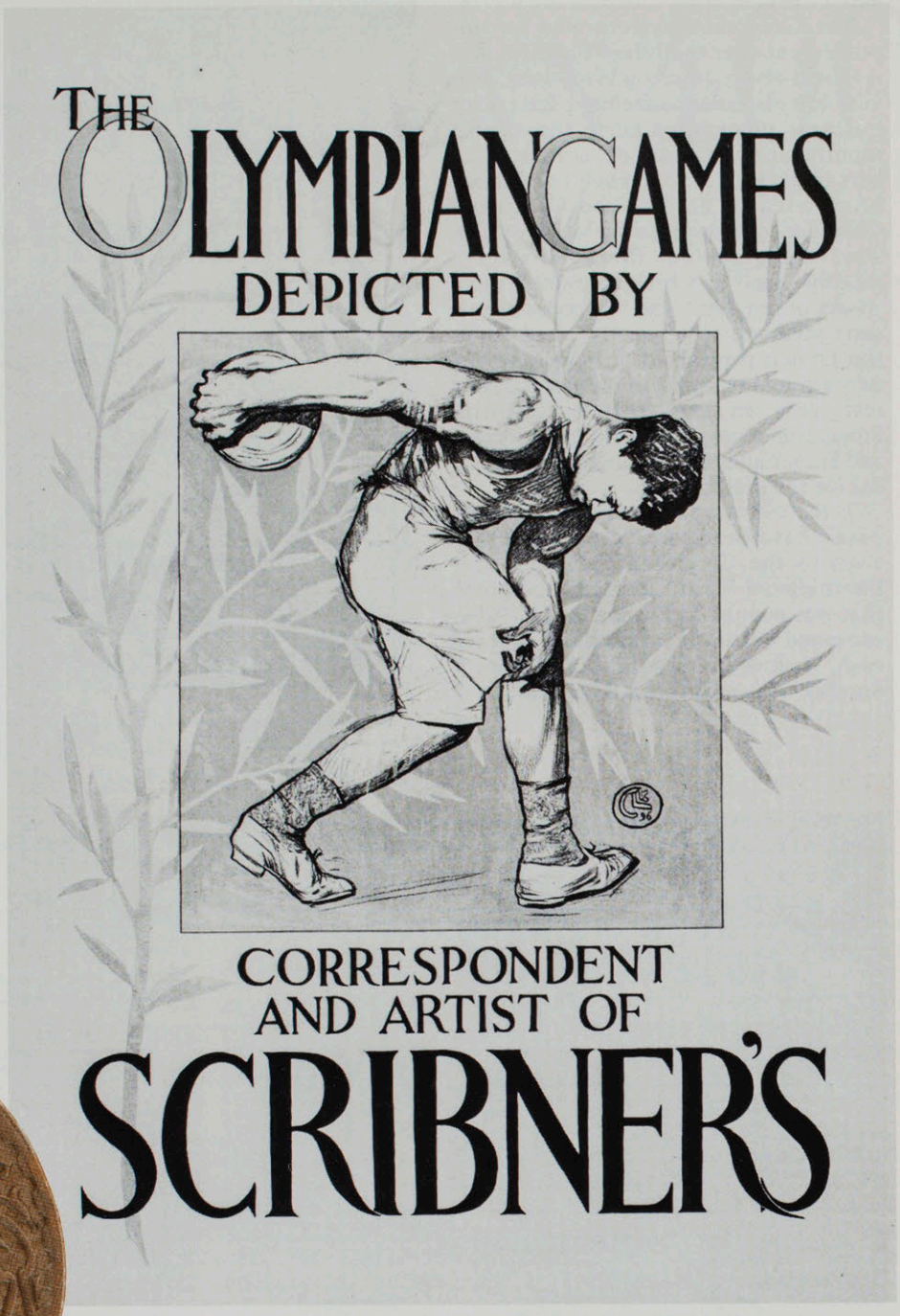
Proposed calendar reforms of the twentieth century include the World Calendar and the International Fixed Calendar. The architects of the latter system probably consigned it to the trash heap of history when they assigned an unlucky 13 months to this calendar.

week day name was added to the end of the year, and a "Leap Day" was inserted at the end of June in leap years. One recent observer has suggested that this thirteen-month calendar might not be a bad idea, especially since he is paid by the month.

The World Calendar plan divided the twelve months into equal quarters, each having a month of 31 days followed by two months of 30 days each. One day was added to the end of the year, and a leap day was inserted at the end of the first half of the year in leap years. These two days were not to be counted as days of the week or month, so that each date of the year would fall on the same day of the week in every consecutive year. This proposal was considered by the United Nations in 1956 but was rejected. The supporters of this plan have not given up yet, as the World Calendar idea seems to reappear every few years.

Lt. Willard E. Edwards of the U.S. Navy proposed his "Edwards Perpetual Calendar" in the 1940s. This plan was very similar to the World Calendar. It consisted of four seasons having three months of 30, 30, and 31 days, with a "New Year's Day" added to the beginning of each year, and a "Leap Year Day" inserted after the end of June in leap years. Both of these days would be holidays, and neither would have a week day name since they fell between Saturday and Sunday. One of the advantages of this plan, according to its promoters, was that it did not have even one Friday the Thirteenth!

Like the Julian system, the Gregorian Calendar is only one of many calendars



The discus thrower who inspired this illustration was one of the American athletes who almost arrived late for the 1896 Olympic Games. His own calendar and that of the citizens of Athens, site of the games, differed by twelve days.





The Muslim Calendar is dated from 622 A.D., when the prophet Mohammed fled from Mecca to Medina. The two coins shown here have the familiar Arabic numerals as well as the Muslim calendar dates, because Palestine and Morocco were administered by European powers at the time the coins were minted.



that have existed throughout the ages. Many ancient cultures devised their own calendars to order their religious and civil life. The Egyptians, Greeks, Chinese, and Aztecs, to name only a few, created calendars based on both solar and lunar cycles that were divided into a variety of months and days. Several cultures continue to use them for observing religious holidays and for providing a chronology of the past. The Gregorian Calendar, however, has been accepted as the universal civil calendar. Athletes who arrive late to the 1984 Olympics in Los Angeles will just have to find some other excuse.

Dr. Sitton is head of the Social History Section at the Natural History Museum and a specialist in urban history.

The four hundredth anniversary of the establishment of the Gregorian Calendar is observed in The Gregorian 400, on display at the Natural History Museum until September 30, 1984. The exhibit includes documents, scientific instruments, and a variety of calendars, both historic and contemporary.

Above: This Aztec Calendar Stone is a replica of a monument built between 1427 and 1479 atop the main temple of the Aztec capital, Tenochtitlan (present day Mexico City). The design on this stone includes religious, astronomical, and calendrical symbols of the Aztec universe. Surrounding the face of the sun god are four squares that denote the four previous ages of the Aztec culture. The circle of twenty squares represents the days of the month. The Aztec year consisted of eighteen months of twenty days each and five intercalary days.

Below: Pocket calendars such as this one were produced in Europe in the seventeenth and eighteenth centuries. When the top discs are turned to the correct month and day, this instrument reveals the time of sunrise and sunset, the proper sign of the zodiac, and the number of daytime and nighttime hours in that day. This portable calendar also contains a compass and sundial.









Mountain Greenery in Southern California Scenery

by DAVID MINOR

Throughout most of the year, color in chaparral vegetation—ranging from rusty ochres to deep glowing gold with a great variety of dusty greens in between—is a recognizable part of southern California's ecology. It is especially noticeable to a visitor from elsewhere with an eye for things alien and exotic and with a feeling of premonition—that he has seen this landscape before. He has. It has been the backdrop, sometimes real, sometimes simulated, for thousands of motion pictures and television programs he has seen at home. Whether he feels *at* home or not because of the familiar look to the place probably depends on how fast he picks up on what it is that is giving him a sense of *deja vu.*

We residents don't pay that much attention anymore. We may notice the big changes between the one and a half seasons when the slopes take on the verdant hues of the new growth each spring and

Top: Valley oak (Quercus lobata) *in March. The bark is adapted to withstand small fires, and even though the leaves have been completely singed off, regrowth is beginning.*

Center: The valley oak in April with yet more growth.

Bottom: The same valley oak from a different perspective in May with Yucca whipplei *and wild radish among the grasses.*

the other change to summer when all the lushness turns brown and sere. Or we may think like the tourist and picture the landscape in our minds always in shades of brown, if we picture it at all. Maybe it just creeps in on us, and we don't think of change on the dried up hillsides until the rains replenish the plants and surprise us, making us realize that there's life in them thar hills. (The surprise of green hills is related to the one we get on those increasingly rare days after a rain when one discovers mountains on a definable horizon behind downtown Los Angeles.)

There is another season in our lives here, but it seems to have no particular rigid schedule aligned with the turning of the earth. It is called the Fire Season. Some would say the Santa Ana winds bring out the fires and their starters, but this is not always the case. Lightning can be a cause of blackened acres; therefore a fire can begin during a rain. The full moon or the desert-born Santa Anas or just plain orneriness bring out the pyromaniac or the accident prone; in the past inhabitants of the land burned the chaparral purposefully as well as accidentally.

Scientists estimate that chaparral needs to burn an average of once every 21 years or so, so as to keep the vegetation from dying out completely under its own dried-out weight. The vegetation is dry and ready to burn after it has had the chance to build up for years without burning.

The accompanying photographs show a little of what happens to plant communities after a fire. The regeneration of the chaparral can be compared to the rebirth of the phoenix bird, new plants and old rising out of the ashes in fine form after a fiery immolation that only helps to invigorate and rejuvenate nature's own.

David Minor is a word processing supervisor at Oasis Petroleum Company and a Research Associate of the Botany Section of the Natural History Museum. His photo essay focuses on an aspect of the natural history of chaparral that will be treated in the Museum's new Botany Hall, which is now in the planning stage.



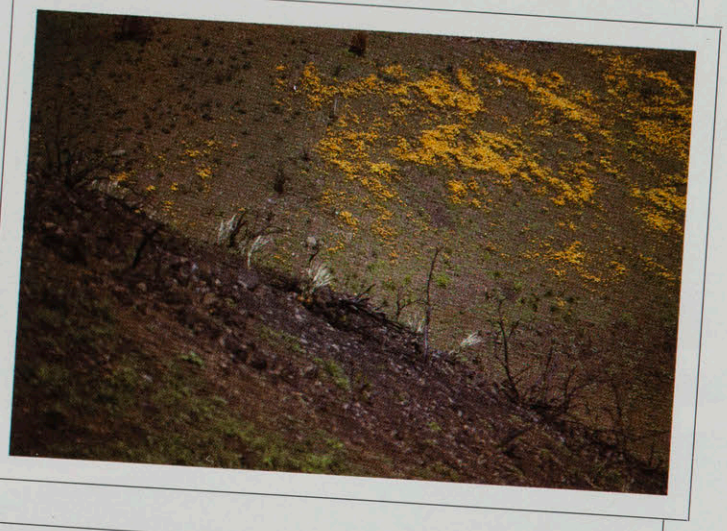




Top: A scorched mountainside starting to recover in March.

Center: The April green looks unreal to those of us who forget that spring does come to southern California.

Bottom: In November the mountains take on a more familiar aspect after a drying summer. Here it is the sky that looks strange to smog-bound Angelenos.



Top: Near the shell of what used to be someone's home is a host of coreopsis blooming in March.

Center, left: Poppies burst forth in April on the same hillside.

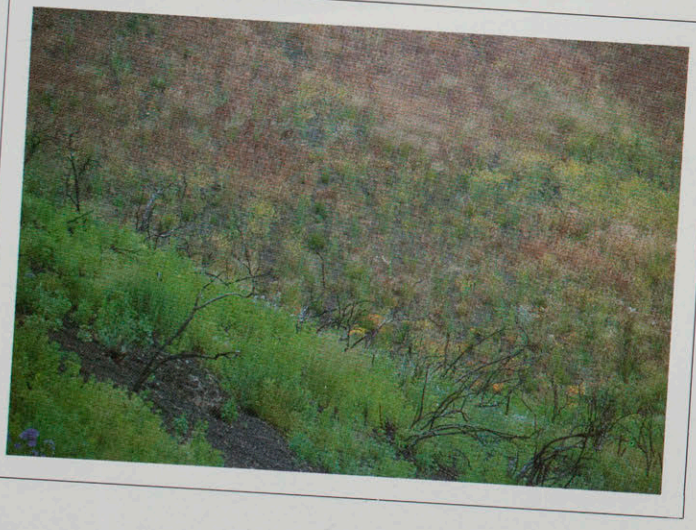
Bottom, left: May mists bring on a profusion of greenery.

Center, right: In early June, Yucca whipplei *and a purple Phacelia or perhaps a composite called* Perezia *are some of last spring wildflowers to survive before the hot onslaught of summer.*

Bottom, right: December sees an almost dormant hillside waiting for rain.



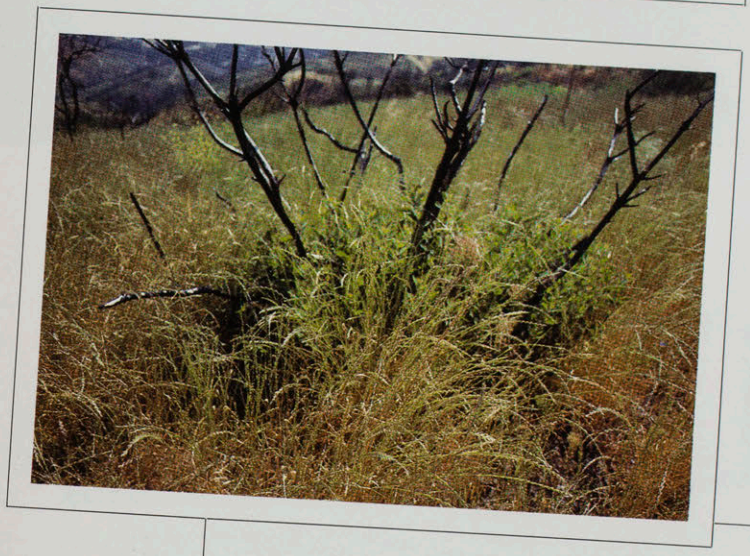
















Top, left: In March, this toyon begins to come back from the ashes of its former self by sprouting from its stump.

Center, left: The toyon continues to grow in April.

Top, right: One of the flowering plants that emerges after a burn is Emmenanthe *or "Whispering Bells," here joining the toyon community in May.*

Center, right: In June, a grass called Lolium *adds to the overall green.*

Bottom: July's heat makes tinder out of the grasses, part of the plan for future regeneration.

November shows us what the mountain valley looks like most of the year.



These live oaks will eventually shed the leaves withered by the fire. The mountain behind shows that the month is May.

"Turkish Rugging" (Chorizanthe staticoides) blooms low among the foxtail and fiddleneck.
Many wildflowers that arise only after a fire, or even hardy annuals, may be too small to be seen with just a casual glance at the landscape.



(Continued from page 2)
collected fossil deposits constitute a scientific reserve for posterity. A portion of these deposits should remain undisturbed until such time as new techniques are devised to obtain the maximum amount of information from new excavations. For those fossil deposits that must be disturbed, a salvage operation must be carefully planned to ensure that the maximum possible amount of scientific information is recovered. Fossils are not renewable resources, and we have a responsibility to future generations to avoid squandering those that are available to us.

The Natural History Museum strongly urges that well-planned salvage of all fossil material be considered early in the planning of any construction activities within the potentially fossiliferous area surrounding Hancock Park. Minimizing the extent of any excavations and thorough testing beforehand for the possible existence of subsurface deposits are two possible approaches to conserving these resources for future generations. The scientific staff of the Natural History Museum is ready to assist during early planning stages of construction projects so that the extent of impact on fossil deposits may be minimized and the greatest amount of scientific data may be preserved.

Curators & Collections

SEAVER CENTER FOR WESTERN HISTORY RESEARCH ESTABLISHED

The Natural History Museum is internationally recognized for its collections of objects that illustrate the development of culture in California and the Southwest. Perhaps less well known is the Museum's equally significant collection of documents, manuscripts and photographs relating to the history of this region. The recent award of a major grant to the Museum by The Seaver Institute of Los Angeles will improve scholarly access to this documentary material, which is preserved in what is now known as the Seaver Center for Western History Research.

The Seaver Center is a unique resource of original maps, journals, pamphlets, manuscripts and books on the West. The center's photographic collection contains more than 100,000 positive and negative images, including many tintypes, ambrotypes and daguerreotypes (the photograph on the cover of this issue of TERRA was taken from a glass negative in the center's photographic archives). The collection also includes early Los Angeles newspapers that are as varied in character and language as the populations they served.

The new funding for the Seaver Center for Western History Research will permit expanded staffing and enlarged facilities; the Museum will thus be able to improve access to its historical collections for research by historians and other scholars from around the world.

DAN COHEN ELECTED SOCIETY PRESIDENT

At their 63rd annual meeting, held during June in Tallahassee, Florida, the American Society of Ichthyologists and Herpetologists elected Dr. Daniel M. Cohen, Chief Curator of the Life Sciences Division of the Natural History Museum, as President-Elect of the Society to serve during 1985. Dr. Cohen specializes in studying the classification, evolution, and general biology of deepsea fishes. The Society, which has more than 2,300 members in 53 countries, has published a technical scientific journal, COPEIA, for 70 years. An annual meeting is held every year at a different locality in North or Central America.

MUSEUM TRAVEL PROGRAM

The Membership Office of the Natural History Museum and Page Museum invites you to participate in a variety of exciting educational adventure tours designed especially for Museum Members.



For more information about these and other upcoming trips, call Judy Astone in the Membership Office, 213/744-3426.

EAST AFRICAN SAFARI
January 19 to February 4, 1984—$3874 (airfare included)
Join Dr. John Harris, Chief Curator of Earth Sciences, and explore the game parks of East Africa with special stops at Olduvai Gorge, Ngorongoro Crater and the Serengeti.

WHALE WATCHING IN BAJA CALIFORNIA
February 11 to 18, 1984—$900 (from San Diego)
This exciting boat trip to explore the islands of Baja and watch the gray whales in San Ignacio Lagoon will be led by Museum Curators Dr. Larry Barnes and Dr. Gary Wallace.

YUCATAN STUDY TOUR
April 6 to 22, 1984—$1610 (plus airfare)
Dr. Frederick J. Bove, specialist on Maya and Olmec civilizations and a popular tour leader, will take Members through the famous Mayan sites of the Yucatan Peninsula.

A GIFT THAT WILL LAST FOR THE WHOLE YEAR: MEMBERSHIP IN TWO GREAT MUSEUMS

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